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TECHNICAL REPORT

75-69-OR/SA

# UNIFORM RATION COST SYSTEM - SUMMARY REPORT

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June 1975

UNITED STATES ARMY
NATICK DEVELOPMENT CENTER
NATICK, MASSACHUSETTS 01760


Operations Research and Systems Analysis Office

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The objective of this study is to develop a uniform ration cost system (URCS) that is directly related to known consumer requirements and that includes provisions which make possible a more flexible food service management system. A comprehensive analysis of the current DoD ration cost system has been conducted, resulting in the identification of areas of potential improvement. One of these areas, the setting of an appropriate level of feeding for DoD, has involved a quantitative comparison of food utilization in the military with that of comparable civilian organizations. The recommended URCS contains

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a Uniform Ration Law that incorporates a cost-date standard (i.e., authorized ration cost as of a selected date). The URCS also provides a more flexible approach for formulating a new food cost index that is consistent with the cost-date standard, nutritional standards, and consumer acceptance considerations. The study describes mathematical programming and computer methods for designing the food cost index. A longer term uniform ration cost system that applies optimization techniques is also identified. A specific organization within DoD is recommended for acting on the study findings and for future review of the system to keep it current with service and consumer requirements.

## SUMMARY

The ration cost system consists of laws, instructions, directives, and other official instruments that control the type, quantity, and cost of food in the U.S. Department of Defense. This study has concluded that the current ration system has a number of deficiencies and is capable of improvement. The formulation of a new, modernized uniform ration cost system (URCS) has been recommended. Proposed features of this system are summarized as follows:

- It should continue to be a monetary control system, and it should retain a dual structure providing subsistence-in-kind and a basic allowance for subsistence.

- The level of feeding for armed forces enlisted members should be based on a comprehensive quantitative comparison of food utilization in the military with that of comparable civilian organizations.

- The preferred Uniform Ration Law (URL) is one that incorporates a feeding standard in the form of a statement of the monetary value of the basic daily food allowance as of a particular date. This cost-date standard should derive directly from the above-mentioned level of feeding analysis.

- A new food cost index (FCI) should be developed consistent with the URL cost-date standard, with military nutritional standards, and with high consumer acceptance considerations. Initially, acceptance criteria can be applied analytically by using recent DoD food utilization data. However, it is recommended that a reference menu approach based on the use of DoD food preference data be introduced in place of food utilization data as soon as practicable. The value of the basic daily food allowance (BDFA) should be determined periodically by costing the FCI using current food prices.

- The URL should explicitly permit the Secretary of Defense to authorize specific types of food service systems to deviate from the normal basic daily food allowance in cases where total system cost-benefit improvements result.

- During the interim period in which the proposed URCS is under consideration by the Defense Department and Congress, the current ration cost system can be improved by revising the existing FCI consistent with food utilization patterns and with the Navy Ration Law.

- In the longer term there is attractive potential in using mathematical programming and computer capabilities to derive the reference menu and the ration cost (BDFA value) based on optimization of food preference, cost and nutritional parameters.

- A standing URCS Committee with representation from each military service and other appropriate organizations should be formed to study and recommend action on the findings of this report and to review and modify the URCS periodically in the future as required.

## PREFACE

Starting with initial efforts in the late 1940's, a number of unsuccessful attempts have been made to draft a Uniform Ration Law that would be acceptable to all governmental organizations concerned. The need for such a law was noted by the Hoover Commission in 1955 and the Commission's Task Force Report on Subsistence contains the following statement: "The Task Force suggests that a Uniform Ration Law be enacted which would rescind present ration legislation and authorize the Secretary of Defense to prescribe uniform rations and whatever special rations may be needed for the military services."

Investigations to develop improved ration legislation continued in the 1950's and 1960's, without achieving the objective of a new Uniform Ration Law. Following establishment of the Directorate for Food Service Management within the Office of the Assistant Secretary of Defense (Installations and Logistics) in 1967, a new food cost index (based upon the 1933 Navy Ration Law) was developed to place the monetary value of the ration on a uniform basis in all military departments. In addition, this Office recognized the system requirement for modern and uniform legislation and associated Department of Defense regulations to control the quality and cost of military feeding, and it supported the Navy in the establishment of a priority project to meet this need. This eventually resulted in the assignment of the Uniform Ration Cost System program to the newly created Operations Research and Systems Analysis Office of the US Army Natick Laboratories (now Natick Development Center) under Task 01 of Project No. 1J662713AJ45 of the Department of Defense Food Research, Development, Testing and Engineering Program.

Planning and the initial manning of the assignment started during fiscal year 1973, and the major research effort occurred during fiscal year 1974 and part of fiscal year 1975. The principal objectives of the effort have been to develop a uniform and improved ration cost system that establishes an appropriate level of feeding for DoD, that is related to changing consumer requirements and that permits more flexible management by allowing trade-offs between food and labor costs.

Because of the broad scope and significant number of separately identified study efforts within the overall Uniform Ration Cost System program, this report is but one of several that document the results of the work. A list of the additional technical reports is provided below.

| NDC TR NO. | TITLE |
|---|---|
| 75-43-OR/SA | The Basic Level of Feeding: A Comparison of Military and Comparable Civilian Food Utilization |
| 75-46-OR/SA | A System for the Preference Evaluation of Cyclic Menus |
| 75-50-OR/SA | A Computer System for Menu Evaluation and Related Applications |
| 75-65-OR/SA | Patterns of Food Utilization in the DoD, Volume I |
| 75-66-OR/SA | An Analysis of Foreign Military and US Institutional Ration Cost Systems |
| 76-5-OR/SA | Patterns of Food Utilization in the DoD, Volume II (Limited Distribution) |
| 75-67-OR/SA | The Development of Alternative Food Cost Indexes |
| ALMC-LSO Project No. 309 | Uniform Food Service Management System |
| 75-63-FSL | Armed Forces Food Preferences |

The conduct of this study was vitally dependent on the collection of information and opinions from an appreciable number of individuals involved in military food service management. Without exception, the requests for information were responded to as expeditiously and completely as possible in spite of the very busy schedules of the Offices to whom the requests were addressed. It would be virtually impossible to acknowledge the help of every person who aided the study team at one time or another during this period. Nonetheless, it is desired to recognize the following individuals who assisted on numerous occasions and to whom special appreciation is due.

- Office of the Assistant Secretary of Defense (Installations and Logistics): Lieutenant Colonel Jerry L. Welbourn, VC, USAF
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- US Army, Office of the Chief of Research, Development and Acquisition: Lieutenant Colonel Dennis Farley, USA
- US Army Troop Support Agency: Miss Shirley McCarthy
- US Marine Corps Headquarters: Major Edward V. Cox, USMC; Miss Joan Niland
- US Navy Food Service Systems Office: Captain A.S. Davis, SC, USN; Captain R.M. Tomsuden, SC, USN; Lieutenant Commander Harry Bishop, SC, USN; Miss Mary Dwyer

The study team was impressed not only with the cooperation of these individuals but also with their overall professionalism and their dedication to the improvement of military food service.

Appreciation is also expressed to members of the Joint Technical Staff at the Natick Development Center. These officers have been Lieutenant Colonel R.E. Pope, VC, USAF; Colonel Norman D. Heidelbaugh, VC, USAF; Lieutenant Colonel C.D. Barbe, USA; Lieutenant Commander K.P. West, SC, USN; Major J. Sabater, USMC; and Major W.R. Belcher, USMC. Together with Dr. E.E. Anderson, Special Assistant for the DoD Food RDT&E Program, the Joint Technical Staff has provided excellent and continuing support to the research effort throughout the study period. Finally, the authors wish to acknowledge the significant contributions made during the program by Drs. Herbert L. Meiselman and Howard R. Moskowitz of the US Army Natick Development Center; Messrs. Robert M. Berkeley and Jack G. Holland, US Army Logistics Management Center; and Miss Marion Bollman, Consultant.

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# SECTION I

# INTRODUCTION

## THE RATION COST SYSTEM DEFINED

The DoD ration cost system is the collection of laws, instructions, directives, regulations, procedures and other documentation that control the type, quantity and cost of food for enlisted members of the US Department of Defense. Major elements of the ration cost system address matters such as food entitlement and monetary allowances, eligibility for actual rations as opposed to commuted rations, control of expenditures for food and commuted rations, and related management procedures and systems. Viewed in its entirety, the ration cost system is a broad and complex study area, encompassing or interacting with important human issues (i.e., nutrition, morale), administration, logistics, training and management matters, as well as the fundamental economic considerations. While reference herein to the existing ration cost system generally means the DoD-wide system, it is to be noted that certain facets of the system are implemented in different ways in the individual military departments.

## THE CURRENT RATION COST SYSTEM

As suggested above, the current ration cost system is a dual system, providing both subsistence in kind (meals as part of a member's pay) and a basic allowance for subsistence (or commuted rations). The underlying basis for the system is Sections 6081-6082, Title 10, U.S. Code. Section 6082, commonly referred to as the Navy Ration Law, is particularly important because it establishes the specific daily allowance of provisions to which each enlisted member of the naval service is entitled. This statutory daily food entitlement has remained essentially unchanged since 1933.

Starting in 1932 the Army ration, and later the Air Force ration, was established under Executive Order 5952. The implementation of this Executive Order resulted in a daily food allowance for these two services which was a lower allowance than that which was listed in the Navy Ration Law and used in the Navy and Marine Corps. This discrepancy was noted by several studies and was corrected in 1967 when Executive Order 11339 and DoD Directive 1338.9 established uniform policies and procedures governing the food allowance for all enlisted personnel based on the above-mentioned Section 6082. The allowance is made operative by the food cost index, which is a list of specified quantities of representative food items documented in DoD Directive 1338.10 and used to compute the monetary value of the basic daily food allowance (BDFA). This is achieved by monthly costing of the index using current Defense Supply Agency and local (for some items) food prices. Each month the dining facilities at a military installation are allowed to spend for food an amount of money equal to the monetary value of the BDFA multiplied by the number of the rations served in the month. The number of rations is based on

the number of people actually fed, and this requires a "headcount" at each meal. The actual number of rations are determined by a formula which currently gives credit for 20% of a ration for each person attending breakfast, 40% for the midday meal and 40% for attendance at the evening meal. In a very real sense the menus served, and hence the quality and quantity of the food offered, are controlled by the money provided by the BDFA computation.

Many enlisted personnel and all officers are authorized a basic allowance for subsistence (BAS). Until 1974, a new value of the BAS for enlisted members was normally made effective annually as of 1 January. This determination of the BAS value was made by the Secretary of Defense with the allowance being set "equal to the cost of the ration," hence yielding a BAS rate essentially equal to the BDFA value at that time.

With the passage of Public Law 93-419, the BAS as of October 1, 1974 is tied to the same percentage increase as the pay increases for federal civilian (General Schedule) and military personnel. Thus, the BAS is no longer directly related to the BDFA value. Enlisted personnel on BAS status may dine in military dining facilities by paying cash for the meals attended. The meal charges are based on the cost of food but are not to exceed the BAS; the current prices for the three daily meals are 20%, 40% and 40%, respectively, of the BAS. The officer BAS rate is prescribed on a monthly rather than daily basis. This rate had remained constant for many decades, but now it too is increased annually by the same percentage as pay increases.

## THE NEED FOR THE UNIFORM RATION COST SYSTEM PROGRAM

The correspondence and discussions preceding the initiation of the Uniform Ration Cost System (URCS) program provide background information on the rationale for the program. The following quote from pertinent correspondence[1] serves to indicate the nature of the requirement:

> "Whether the method of uniformly costing the ration is established by law, Executive Order, or OSD policy, it is essential that there be a sound basis for how it is accomplished. It cannot be an arbitrary thing; all those involved (food service, budget, and policy personnel) must have faith in the costing of the ration. The presently used Navy Ration Law is archaic, inflexible, does not represent foods actually being used, and has been a source of problems and confusion for years. DoD has used the Navy Ration Law because of a lack of any other established means of calculating the cost of the ration.

[1] Memorandum for the Assistant Secretary of the Army (I&L) from the Acting Assistant Secretary of Defense (I&L), Subject: Uniform Ration Costing Study, dated 29 December 1971.

> There is a definite and immediate need for a soundly and scientifically based ration costing method as a replacement for the Navy Ration Law. The costing of the ration is the foundation for the DoD food service program and there is no other task under the DoD Food RDT&E program which would have greater impact or more directly support this program than the accomplishment of the uniform ration costing study."

The preceding addresses the most important aspects of the URCS program: the setting of a modern and appropriate food allowance, the conversion of that allowance into a monetary control over food costs, and the recommendation of suitable implementing directives and legislation.

In addition to these important thrusts of the program, another problem area was defined. This problem relates to the entire feeding system, not just the food element of the system. It is concerned with the fact that current food service management methods do not allow for trade-offs between food costs, labor costs, and other operating and capital costs, such as investments for facilities and equipment. The constraint stems from the DoD vertical budget structure which requires separate funding of food, labor, facilities, and equipment. Thus, the mechanism does not exist whereby savings accrued in one cost area of food service operations such as labor, can be balanced against increased spending in another cost area, such as food. One effect of this situation is that it may preclude the effective application of food service technology--for example, the use of the available range of convenience foods to reduce scarce labor resources. The systems approach to enhance the overall cost-benefits of the feeding system is thereby inhibited. This general problem area--one directly concerned with the "management of change" in military food service--became a second focus for the program, albeit one of lower priority.

## PROGRAM OBJECTIVES

The objectives of the Uniform Ration Cost System program are to:

1. develop a uniform ration cost system which will be directly related to known consumer requirements, including derivation of a supporting method for computation of a recommended basic daily food allowance, and

2. include provisions in the new system that make possible a more flexible food service management system which will encourage and be responsive to changing requirements in military food service and innovations and new technology in the food and food service fields.

This technical report does not include all of the conclusions and recommendations reached in this overall program. However, in keeping with the preceding broad objectives, it does directly address the following major areas:

– the basic form (type of control) of the URCS.

– a procedure for establishing a reasonable and justifiable level of feeding for the US armed forces.

– immediate steps for achieving a partial improvement in the food cost index under the Navy Ration Law.

– a specific basis for a new Uniform Ration Law, including a more flexible method for formulating a new food cost index and an initial approach for permitting food service management decisions to be predicated on cost-benefit considerations at the systems level.

– a concept for a longer term basis for the URCS.

– a DoD organization to act both to bring the URCS into being and to periodically review and revise it as required.

## SUMMARY OF MAJOR STUDY ACTIVITIES

The following description is deliberately brief since subsequent sections of this report provide additional information on the major study activities and results. Figure 1 provides a simplified overview of the technical effort and will be used as a frame of reference for this discussion. An appreciable amount of study effort has been devoted to the top four subtasks shown on the left of Figure 1, and most of the information developed in these areas is found in the other URCS reports (see Preface).

a. **Data Collection.** First, a large scale data collection effort centered on an analysis of actual food utilization by DoD dining facilities. Basically, this effort analyzed the utilization of some 500 food items for each ration served; thus, results for each item are expressed in "pounds per ration." All computations are based on **purchased** quantities of food items. The primary purpose of the DoD food utilization data collection has been to determine whether the Navy Ration Law and the food cost index accurately reflect current military food usage patterns. Altogether, the food purchases related to about 37 million rations have been analyzed. Second, a parallel effort has involved the collection of food utilization data from five civilian organizations judged to be comparable to DoD feeding. Common characteristics included the age, sex, and physical activity of the consumers, the existence of a primarily voluntary feeding situation, and the routine offering of three prepared meals a day. The civilian utilization data has been compared with the military data, as described below. Third, extensive data has been collected on the food preferences of military consumers from all services on approximately 360 different menu items. This DoD food preference data has been utilized in several study areas--for example, in developing reference menus which are based on high consumer food preferences.

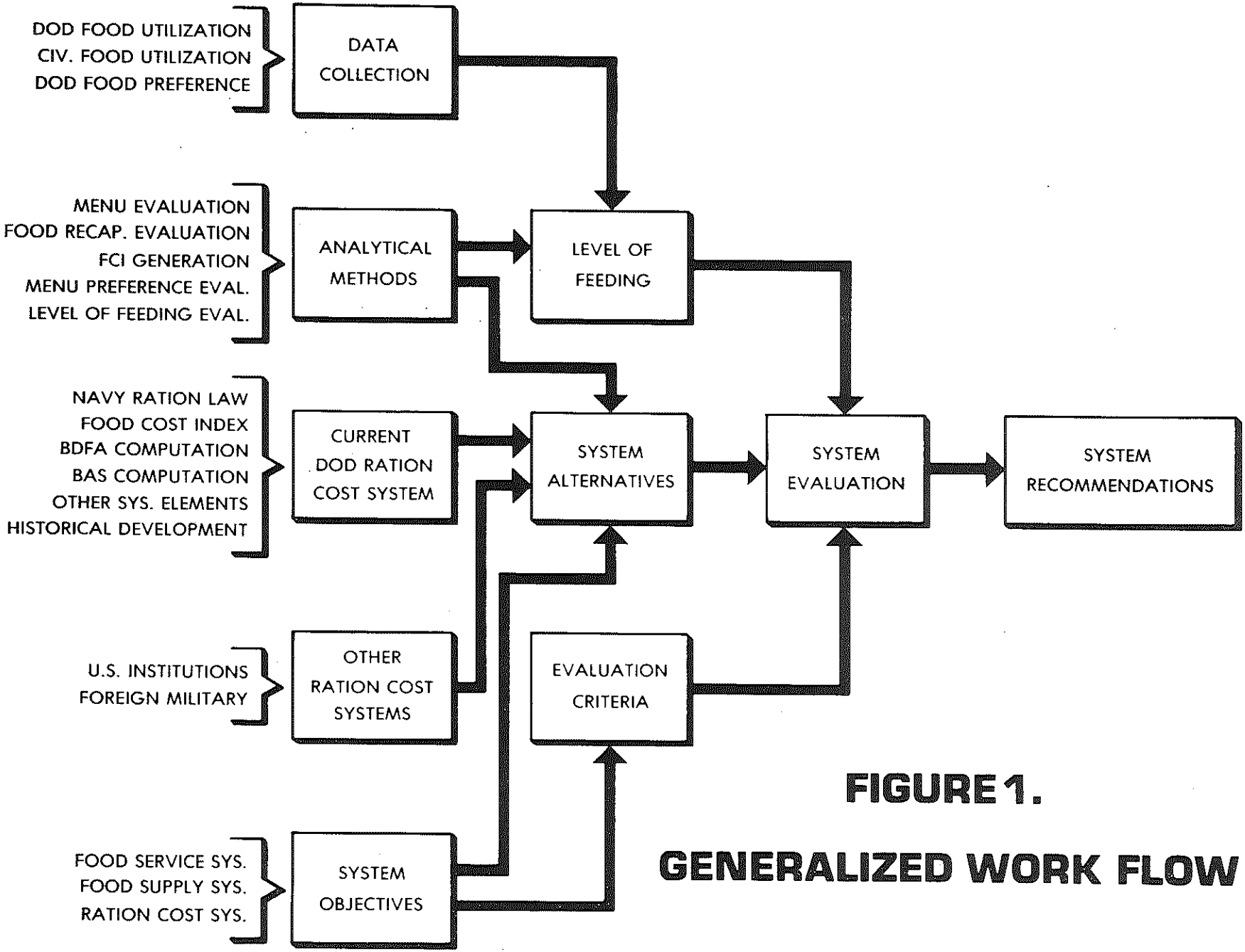


**FIGURE 1.**

**GENERALIZED WORK FLOW**

**b. Analytical Methods.** It was determined at the outset that it would be necessary to develop methods to carry out several desired analyses in an effective manner. Because of the large amounts of data involved, virtually all of these methods have involved the use of the computer. One of the most important products of this work is a system for evaluating the cost, nutrition and preference of cyclic menus; this system offers greater flexibility and coverage than other methods known to be available. The system can also provide analyses of these same parameters for lists of food types and quantities that are related to known consumption (number of rations served). An example is the capability to analyze food recapitulation lists which represent the basic food requirements to feed a given cyclic menu to a specified number of persons. Since the formulation of new food cost indexes is an area of obvious interest, and because this has previously been a manual computation, more efficient methods have been developed. These methods can provide a solution within given constraints (e.g., those imposed by the Navy Ration Law), while simultaneously yielding an index which is generally consistent with known food utilization patterns. If Navy Ration Law constraints are removed, the index can be constituted so that the costs of the various food groups (e.g., vegetables), the poundage usage for these groups, and the poundage usage for particular items (e.g., carrots) within each group are proportionate to actual utilization experience in DoD food service systems. A new methodology has also been developed for evaluating the overall preference of a cyclic menu, such as the 42-Day Armed Forces Master Menu. This approach uses the basic preference data (hedonic values) for individual recipes (e.g., glazed carrots) but introduces one modifying factor to reflect the fact that preference for a recipe is a function of time since its last serving and another factor to reflect the relative weights of meal components (e.g., an entree contributes more to overall preference for a meal than does a salad). Another important method developed is that used in the level of feeding evaluation. This approach provides a comprehensive comparision of the feeding practices in different organizations on the basis of four food usage criteria: cost, quality, quantity, and nutrition.

**c. Current DoD Ration Cost System.** A fundamental and very important part of the study has been to gain an understanding of the current ration cost system. This has involved an identification of the strengths and weaknesses of the system, with emphasis on areas of potential improvement. Particular attention has been directed to the Navy Ration Law and the food cost index, but the analysis also considers all functional elements of the current system, such as those covered in **Manual for the Department of Defense Food Service Program,** DoD 1338.10-M, and **Department of Defense Food Service Program,** DoD Directive 1338.10. An additional facet of the work in this area has been a short study of the historical development of the current ration cost system. This effort has provided particular insights into how and why the system has evolved into its current form. A review of the work directed toward the development of a Uniform Ration Law in the 1950's and 1960's has been of considerable pertinence and value.

**d. Other Ration Cost Systems.** The realization that other institutional organizations are operating under ration cost systems that effectively satisfy their particular needs led to the early decision to identify the most desirable features of such systems. The purpose of this research has been to identify procedures that might prove useful in a revised DoD system; thus, the information collected has been screened to develop system alternatives for further evaluation in this program. Included in this analysis are the ration cost systems of nine foreign military organizations, such as Canada and the United Kingdom,and six domestic organizations, including the Coast Guard and the Veterans Administration.

**e. System Objectives.** Objectives originate from three areas: first, the objectives of military food service systems; second, the objectives of the associated food supply systems; and finally, the objectives of the ration cost system itself. Criteria based on these sets of objectives have been used in the evaluation of the various alternative ration cost systems.

**f. Level of Feeding Study.** This study has been made to compare military feeding with that occurring in comparable civilian organizations. As previously stated, this involves comparisons of the usage of all types of food on an "as purchased" basis in both types of organizations. Equitable cost comparisons were achieved by costing out the per ration food utilization to a common food price list. The civilian organizations included in the sample are a state university, football team, merchant marine ship, off-shore oil drilling platform, and a law enforcement academy. The results of this analysis not only produce a relative comparison in level of feeding but also enable a judgment to be made of the appropriate absolute level for DoD in terms of the cost of the ration and the per person per day utilization of food items.

**g. System Alternatives.** A significant program effort has been directed to active consideration of possible changes to the current DoD ration cost system. The changes and alternatives are of two basic types: major changes involving significant structural changes to the system, such as a shift to some other form of control from the current monetary control, and minor revisions, such as changes to the components in the existing food cost index. Ideas for system alternatives derived from several previously mentioned subtasks, particularly the evaluation of the current system and the study of institutional ration cost systems. Several additional system alternatives not in use in any other organization have been originated by the program team.

**h. Evaluation Criteria.** This activity has been undertaken to provide a consistent basis for making judgments about the merits of the various system alternatives considered. As mentioned previously, the evaluation criteria derive from system objectives--i.e., how well do the proposed alternatives contribute to the purposes for which the ration cost system exists, and which alternatives should be recommended for adoption?

i. **System Evaluation.** The evaluation has focussed the results of the previous subtasks. The major thrust of the system evaluation effort has been to identify those alternatives that offer the greatest improvements over the current system within the appropriate level of feeding (ration cost). A wide range of potential improvements have been identified based on deficiencies in the current system and on innovative approaches either noted in other ration cost systems or conceived during the study. These candidate ideas have been screened for feasibility and projected effectiveness in terms of the ration cost system objectives and criteria.

j. **System Recommendations.** The preferred uniform ration cost system is described. This description includes the recommended overall structure of the system and the detailed approach for the Uniform Ration Law, the food cost index, and related system elements. The analysis has led to the conclusion that certain desirable changes can be made to the system in the near term, other changes will take longer because of the need for more inter-service coordination and Congressional approval, and still other recommendations must be reserved for the more distant future because of the need for further research to determine whether the approaches do in fact yield the anticipated benefits.

## SECTION II

## REVIEW OF THE NAVY RATION LAW AND FOOD COST INDEX

### APPROACH

As indicated in Section I, one of the key efforts in the URCS study has been the review and analysis of the current ration cost system. The purpose of this work has been to gain a basic understanding of the system in order to determine how it may be improved. In the process, the review has noted what the most distinctive and important features of the system are and which features represent particular strengths or weaknesses in terms of current ration administration.

In undertaking this effort, the study team has been quite conscious of the fact that the current ration cost system functions reasonably satisfactorily. As such, the current system represents a baseline capability against which any proposed changes need to be evaluated. This is one way of saying that in designing an improved system an attempt must be made to avoid changes merely for change's sake and that any changes recommended for near term implementation have to both provide an improvement over the existing approach and be capable of being placed into practical use. The fact that the current system does work probably explains why most service people appear to take it for granted. Perhaps as a result of this general acceptance of the system (at least at the operating level), there have been relatively few critical examinations of the system.

In carrying out this research effort, several sources of information have been utilized in studying the current system. These sources include:

a. Background information specifically related to the URCS Program. This consists primarily of correspondence between relatively high level DoD R&D and food service management officials. This material mentions certain deficiencies in the current system and expresses the need for the program but does not contain any comprehensive, point-by-point discussion of the system.

b. Written material produced within the military. For the most part, this consists of manuals, directives, and related publications, but it also includes a few journal articles and speeches by Government officials. Generally, this category of information is descriptive rather than critical in nature.

c. Study Reports. A few previous studies and study proposals on food service management provide useful information. Certain of these documents will be referenced in this report; the performing organizations include the Logistics Management Institute, PRC Systems Sciences Company, and the Institute for Defense Analyses.

d. Discussions with DoD and military departmental food service systems management personnel. This has provided a rich source of information since these are the military and civilian professionals who direct military food service at the higher management levels and who are most knowledgeable about it.

e. Survey of food service management. A questionnaire designed to elicit information relative to areas of potential improvement in the system has been developed by the study team and administered to a group of food service professionals in the headquarters food service offices.

f. Discussions with consultants. A small number of Natick Development Center consultants have been used in the program and have assisted in reviewing the current system. In addition, the National Research Council Committee on Food Service Systems has reviewed the research plan and provided comments.

g. Discussions with Natick Development Center Personnel. The combined experience of Natick Development Center personnel familiar with ration cost systems in both this and other programs has been utilized.

The net result of collecting information from all of the above listed diversified sources has been to provide a broad base of facts and opinions from which to reach conclusions about the operations of the existing ration cost system and possible future systems. Those observations considered pertinent to possible modifications in the current system are discussed below.

## ELEMENTS OF THE CURRENT RATION COST SYSTEM

The discussion in Section I has indicated that there are a number of functional elements in a ration cost system and has described in broad terms how the system operates in controlling the cost of the ration. Figure 2 will be utilized at this point to provide a more complete presentation of the elements of the system as an introduction to the subsequent technical observations relative to possible improvements.

Referring to the right side of Figure 2 and starting at the top, the Navy Ration Law (Sections 6081–6082, Title 10, U.S. Code) serves as the underlying basis for the level of military feeding. It exercises this function by providing a statutory (legal) statement of the daily food entitlement for the enlisted member. The entitlement is expressed in terms of 14 food components (articles) which are listed in Figure 3. The law does not make it mandatory that each member receive precisely these quantities of foods, however. Rather, flexibility among the article quantities is afforded by inclusion in Section 6082 of the statement that "Any article of the Navy Ration may be issued in excess of the authorized quantity if there is an under issue of the same value in other articles."

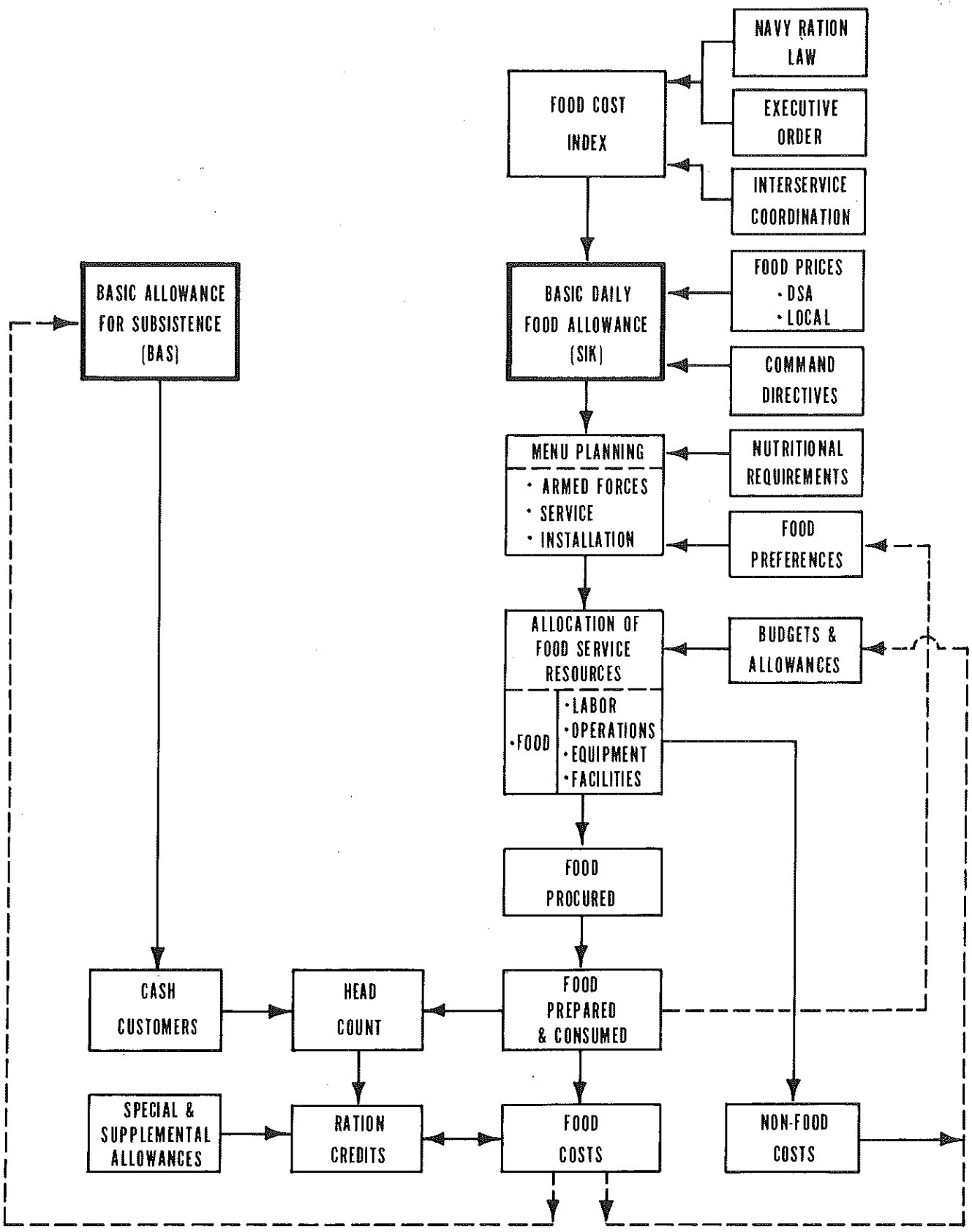


FIG. 2. CURRENT DOD RATION COST SYSTEM

**Figure 3**

## THE COMPOSITION OF THE NAVY RATION

(Section 6082, Title 10, U. S. Code)

The Navy ration consists of the following daily allowance of provisions:

1. Eight ounces of biscuit or twelve ounces of soft bread or twelve ounces of flour.

2. Twelve ounces of preserved meat or fourteen ounces of salt or smoked meat or twenty ounces of fresh meat, fish, or poultry.

3. Twelve ounces of dried vegetables or eighteen ounces of canned vegetables or forty-four ounces of fresh vegetables.

4. Four ounces of dried fruit or ten ounces of canned fruit or six ounces of preserved fruit or sixteen ounces of fresh fruit or six ounces of canned fruit or vegetable juices, or one ounce of powdered fruit juices, or six-tenths of an ounce of concentrated fruit juices.

5. Two ounces of cocoa or two ounces of coffee or one-half ounce of tea.

6. Four ounces of evaporated milk or one ounce of powdered milk or one-half pint of fresh milk.

7. One and six-tenths ounces of butter.

8. One and six-tenths ounces of cereal or rice or starch foods.

9. One-half ounce of cheese.

10. One and two-tenths eggs.

11. One and six-tenths ounces of lard or lard substitute.

12. Two-fifths of a gill of oils or sauces or vinegar.

13. Five ounces of sugar.

14. Such quantities of baking powder and soda, flavoring extracts, mustard, pepper, pickles, salt, sirup, spices, and yeast as required.

In 1967, Executive Order 11339 (Figure 2) and DoD Directive 1338.9 placed all military services under a ration cost system in which a common food cost index was developed to provide an equivalent monetary allowance per person per day. It was directed that the components of this index should be derived from Section 6082, Title 10, United States Code. In view of the fact that the Navy Ration Law (Section 6082) constrains the food cost index, which in turn directly controls funds allowed for food, these two documents emerge as the most important elements of the ration cost system. This importance is demonstrated by the fact that any changes to the index are handled through interservice coordination (Figure 2) rather than solely by the Office of the Secretary of Defense or by some particular service.

The basic daily food allowance (BDFA) is a prescribed quantity of food, defined by components and monetary value, which is required to provide a nutritionally adequate diet for one man for one day. The monetary value of the BDFA is determined by multiplying the quantities for each food item in the food cost index by unit prices provided in the most recent price list published by the Defense Personnel Supply Center (DPSC) or, in the case of a small number of items, local prices. The resultant item costs are then summed and a percentage is added for the purchase of unlisted condiments to obtain the BDFA value for use in purchase of food for meals for personnel falling within the subsistence-in-kind (SIK), or "meals as a part of pay" category. Command directives are shown in Figure 2 to indicate that the monetary value of the BDFA can be affected by directives from the Office of the Secretary of Defense. This is known to have occurred in at least one case in recent years in which a temporary reduction of 2-1/2 to 5% in the cost of feeding was placed in effect.

Menu planning is carried out at three levels: 1) the Armed Forces Menu Service Committee (operating under the Department of Defense Food Planning Board) produces a "42 Day Armed Forces Menu" for general guidance and optional use within the military services, 2) certain service headquarters provide centrally prepared menus (usually 42 days in length also) for optional use within their service, and 3) each installation normally prepares a cyclic menu for actual local use by dining halls within that installation. In some cases the installation menu is patterned closely on one of the other two types of menus. Requirements relative to nutrition for military food service are provided in "Nutritional Standards," Army Regulation No. 40–25, BUMED Instruction No. 10110.3D, and Air Force Regulation No. 160–95. Food preference survey information collected by the Food Sciences Laboratory, U.S. Army Natick Development Center, is routinely made available to the Armed Forces Menu Service Committee and the service headquarters. Local observations on food preferences, whether objectively or subjectively obtained, are normally considered in the preparation of installation menus.

The allocation of resources for non-food costs within military food service is shown in Figure 2. The budgeting and control of the cost of food are maintained separate from other food service cost elements, and as currently defined and operated, the ration cost system is concerned exclusively with food costs. However, "Non-Food Costs" (Figure 2) are a major source of costs of any food service system. Therefore, this report will present findings and recommendations relative to consideration of **total** food service systems costs within the Uniform Ration Cost System. Study efforts in this area have been extremely limited in relation to efforts in the food cost control category. Therefore, recommendations are considered a first step forward in including and considering these other costs in the system.

The steps of procuring and utilizing food result in the accumulation of food costs and the collection of signature head counts. The latter yield the number of meals served, which are then converted into ration credits on the basis of 20%, 40%, and 40% of a ration for each person served breakfast, lunch, and dinner, respectively.

Ration credits also result from the attendance of personnel entitled to a basic allowance for subsistence (commuted rations), or to a per diem allowance in lieu of subsistence. Such personnel are required to reimburse DoD at a designated cash meal rate for each meal taken. Extra ration credits are received for dining units entitled to supplemental or special allowances. Supplemental food allowances not to exceed 15% of the BDFA are authorized for small dining facilities which either feed an average of less than 100 enlisted members or support an activity having an authorized complement or less than 150 men, provided they meet other stipulated conditions. Special food allowances may be prescribed (by the Military Department Secretaries) when required to support operational missions, such as field feeding or submarine feeding.

The double-headed arrow at the bottom of Table 2 is intended to signify that ration accounting involves balancing ration credits against food costs. Ration credits equal the number of rations served during a specified period (monthly or quarterly) multiplied by the monetary value of the BDFA for that period. Food costs are determined by adding the monetary values of the opening inventory of food and the food receipts during the period, then subtracting the value of the ending inventory.

For more detailed information on the operations of the ration cost system, the reader is referred to **Manual for the Department of Defense Food Service Program**, DoD 1338.10--M, and **Department of Defense Food Service Program**, DoD Directive 1338.10, dated 14 January 1972.

The preceding discussion has indicated the significant importance of the food cost index (FCI) because of its role in regulating the cost of the basic ration. The Navy Ration Law (NRL) is also of importance to the working of the ration cost system since, as previously stated, the components of the FCI are based on the types and quantities of food items prescribed in that law (Section 6082, Title 10, U.S. Code). Because of the significance of these parts of the system, the remainder of this section is devoted exclusively to the FCI and the NRL. The discussion of other elements of the ration cost system (e.g., BAS, headcount) will be deferred to a later report.

## THE NAVY RATION LAW: STUDY FINDINGS

### BACKGROUND

The first Navy Ration Law, which was enacted by the Congress in 1794, provided a fixed allowance of specific food items for each day of the week. In 1842 the fixed allowance approach was discarded in favor of a more flexible allowance of food items, and substitution of designated foods was permitted. The law was amended several times between 1861 and 1906, resulting in a new list of food components with specific substitutions. In 1907 these itemized substitutions were replaced by the following:

> "Any article comprised in the Navy ration may be issued in excess of the authorized quantity, provided there be an under issue of the same value in some other article or articles."

The present form of the law was passed by Congress in 1933; this revision provided for greater issues of fruits, vegetables and milk while decreasing the issues of bread and meat. The "over and under" clause was retained. Except for minor changes (the addition of fruit and vegetable juices and the enrichment of flour), the 1933 Act provides the list of food components and quantities that apply today. Appendix A is provided for those readers interested in a more detailed history of the development of the NRL. The authors are indebted to Captain John C. Herron, SC, USN (Retired), for providing this historical material.

The Army and Air Force Ration Laws (dated 1955), Sections 4561 and 9561 of Title 10, U.S. Code, respectively, confer authority on the President to prescribe the components, and the quantities thereof, of the rations for these services. This method of defining the ration for the Army has been applicable since 1901; prior to that year the specific food items of the Army ration had been legislated by the Congress in roughly the same fashion as in the Navy Ration Law. In the intervening period between 1901 and 1967 the differing approaches to defining the ration allowances resulted in rations having somewhat different monetary values being offered by the individual services. This

was officially noted in the Hoover Commission Report [2] of 1955 which stated that based on its study "....the Navy ration exceeds that of the Army and the Air Force." Subsequent studies also confirmed that such differences in the value of the ration served did, in fact, exist.

Attempts to draft uniform ration legislation commenced as early as the late 1940's and continued sporadically through the 1950's and into the 1960's. In 1967 Executive Order 11339 delegated the authority to prescribe the Army and Air Force rations to the Secretary of Defense, paving the way for DoD Directive 1338.9 which established a uniform food allowance for all services based on Section 6082 of the Navy Ration Law. The 1969 White House Conference on Food, Nutrition and Health then added new impetus to the need for a uniform ration law by making the following recommendation:

> "The objective of our recommendation is to develop, publish and distribute qualitative and quantitative guidelines for maintaining a high level of fitness and strength for performing general military tasks while counteracting insofar as possible various forms of malnutrition, for example, overnutrition resulting in obesity.
>
> **We recommend:**
>
> That the Uniform Ration Law legislation prescribe a single quantitative and qualitative uniform allowance per man per day of nutritionally adequate and consumer-acceptable food based on the Recommended Dietary Allowances prescribed by the Food and Nutritional Board, National Research Council, National Academy of Sciences – usage applicable to the four military services and their respective academies."

In spite of this six-year old recommendation and all of the preceding efforts to develop a uniform ration law, the Navy Ration Law is still in effect. The findings of this study relative to that law will now be presented.

## DISTINCTIVE FEATURES OF THE NAVY RATION LAW

The key features of the Navy Ration Law (Sections 6081–6082, Title 10, U.S. Code) are that it provides:

1. the basis for the ration entitlement

[2] "Food and Clothing in the Government", 84th Congress, 1st Session. House Document No. 146, U.S. Government Printing Office, 1955.

2. the food components and quantities that comprise the ration entitle- entitlement

3. an "over and under issue" clause which permits some flexibility in the issue quantities of the foods in the ration entitlement

4. a law to govern the ration

Relative to the first point above, the operative statement for the ration entitlement is found in Section 6081:

> "Except when entitled to a basic allowance for subsistence or a per diem in place of subsistence, each enlisted member of the naval service is entitled to a Navy ration for each day that he is on active duty, including each day that he is on leave."

This statement has now been applied to all military departments in DoD Directive 1338.10 (paragraph V.A.) and DoD 1338.10–M (paragraph 7–2.a (2)) by substituting "military services" for "naval service." Further, the words "Navy ration" are replaced in these documents with "daily food allowance." A fundamental aspect of this statement of entitlement is that it is based on a food allowance for one person for one day and makes no note of allowances for individual meals or for other periods of time.

The second feature of the law concerns the list of food components and quantities in Section 6082 that define the composition of the ration and that therefore have an important impact on military feeding. In this regard the law has two important effects:

–it "guarantees" that a certain amount of food shall be procured for each member every day, and

–it sets a form of control on the issue of food and hence on the costs of food.

Both of these effects are evident in the food cost index, which is structured to be consistent with the food articles in the law and is used to compute the amount of money required to purchase the daily food allowance, based on the current price of individual food items. This application of the law through the food cost index is regarded by this investigation as the principal current use of the law. Largely resulting from this use but on a more generalized level, the law is also looked upon as the underlying basis for the overall military feeding program. That is, even when not linked to its legal ramifications, it is generally regarded as the basic statement of the appropriate level of feeding (in a "raw" food sense) for the armed forces of the United States.

With respect to the third listed point, the statement in Section 6082 which gives the Navy Ration Law its flexibility is now stated as follows:

> "Any article of the Navy ration may be issued in excess of the authorized quantity if there is an under issue of the same value in the other articles."

A key word here is "issue" because although the components of the food cost index are strictly maintained on a one-for-one relationship with the law, no such constraint is placed on the actual issue (purchases) of food for use in military dining facilities. Initially, this clause was introduced to permit substitutions among the foods legally prescribed in the articles to allow for factors such as the availability of foods at a given time and location and to reduce the monotony of the fixed list of foods. Subsequently the clause has come to be interpreted so widely as to permit an extremely wide variety of foods to be used. In fact, it is quite likely that it is this interpretation that has made it possible for the law to survive virtually unchanged over a 40-year period in which foods and food service systems have undergone major modification.

The final feature of the Navy Ration Law is the importance attributed to the fact that it is a U.S. law (statute). Because the changing of a law is often a difficult and time consuming process (a point borne out by the effort involved in the last major change to the NRL in 1933), the tendency appears to be to let a law continue unless there are particularly significant reasons for modifying it. The history of the numerous attempts over recent decades to draft uniform ration legislation, and to formulate uniform food allowances without legislative changes, suggest that the submission of new ration legislation to the Congress has merely awaited an appropriately documented and agreed upon basis for such a proposal. This program provides recommendations directed to such an end product.

## ANALYSIS OF THE NAVY RATION LAW

**Is There a Need for a Law?** In considering the Navy Ration Law, a fundamental question is whether a law setting forth daily food allowances (or comparable feeding standards) is actually required.

In investigating this question, use has been made of a body of information developed by this study and concerned with a survey of ration cost systems [3] in use by other organizations. This survey has encompassed six U.S. institutions and the armed forces of nine foreign governments. In reviewing this research it has been noted that there is no evidence that any of these ration cost systems are based on a national law except

[3] Richardson, R.P., "An Analysis of Foreign Military and U.S. Institutional Ration Cost Systems", US Army Natick Development Center TR–75–66–OR/SA.

in one case, the U.S. Coast Guard. The statute (13 USC 478) covering the Coast Guard ration merely states that enlisted men shall be allowed a ration as prescribed by the Secretary, and thus it is effectively equivalent * to the previously mentioned Army and Air Force Ration laws. Therefore, the survey does not reveal any instances in which food components are defined by law. However, a large number of these organizations do exercise ration control by employing official food component listings, the difference being that these lists are promulgated in the form of Department or Military level regulations, orders or directives. Generally, fiscal control over military food allowances at a higher level than the defense ministry is exercised by the national financial authority (e.g., National Treasury Board), which must approve food allowance amendments recommended by the military in cases where funding changes are involved. While it has not been practicable -- nor was it intended -- to evaluate these other systems in the depth, an overall observation (based in some cases on conversations with food service officials) is that the systems are reputed to be operating satisfactorily and achieving a good level of consumer satisfaction. This does not represent a direct comparison with DoD food service, but it does indicate that somewhat similar systems do operate adequately without benefit of a legally prescribed list of ration components or other forms of legal control. As a result it is concluded that such a law is not essential to ration administration and that it is possible to design a DoD ration cost system that would operate effectively under Executive Order or DoD Directive/Instruction, supported by military department regulations. However, even though this approach is feasible for application in a new ration cost system, it is necessary to address the issue of whether it is preferred.

As suggested by the preceding subsection on the background of the NRL, a historical perspective of U.S. military ration management indicates that the military departments have traditionally, and apparently without exception, operated under ration laws. This must be interpreted as a strong indication of the intent of the Congress and the wishes of the military that the ration should be a subject of law. In addition, there have been no known recent proposals from the Congress, Executive Department, DoD or military departments to change this situation. Finally, the recommendations of the previously mentioned Hoover Commission in 1955 and the White House Conference on Food, Nutrition and Health in 1969, plus the efforts of the DoD to draft uniform ration legislation over the past two decades, indicate the basic desire to develop a more practical and modernized ration law rather than to reduce the ration cost system to one which operates without a law.

* The actual monetary value of the basic Coast Guard ration is determined in the same manner as that utilized within the DoD (i.e., by costing out the FCI using DPSC food prices).

Further, the "guns or butter" consideration applies to this situation. Coordination with military food service management indicates that they support a ration law which insures a feeding standard, in that such a standard discourages--in fact, prevents--tradeoffs between expenditures for food and for non-food service (e.g., weapons) military items. It is the opinion of the study team that if there were no statute governing the food allowance it is likely that degradations in the quality of feeding would occur similar to results that have been noted[4] involving the diversion of operations and maintenance funds intended for food service labor, equipment, facilities, and supplies to other mission areas.

With respect to the composition of the ration law, it was previously noted that the NRL has contained a list of food components since 1794 and that prior to 1901 the Army ration was also defined in such terms. Since 1967 the rations served by all services have been directly affected by the food components of the NRL. The position generally taken by the services is that the legally documented component listings are necessary to establish a ration which is protected against unwarranted reductions resulting from food price fluctuations or budgeting actions. The degree to which such protection actually exists will be discussed later, but previous experience during the extended period in which the naval service operated under a law containing components and the Army and the Air Force (after 1947) did not, clearly established that the former enjoyed a higher level of feeding (i.e., higher cost per ration). In some cases this difference was as much as 30 percent, although generally it appears to have been smaller. Probably as a result of this experience, during the Uniform Ration Law formulation attempts in the 1950's and 1960's the military departments took a firm and consistent position that the URL should contain a list of food components, eventually resulting in the Bureau of the Budget agreeing to drop its proposal that the Secretary of Defense be assigned the authority to set the monetary value of the ration.

During these negotiations, the reasons given by the DoD for the requirement for a list of basic food components in a Uniform Ration Law were:

1. A monetary allowance cannot insure the nutritional adequacy of a ration.

2. A serviceman's food allowance should not be controlled by monetary restrictions established at some specified time or date.

[4] Berkeley, R.M. and Holland, J.G., "Uniform Food Service Management System," U.S. Army Logistics Management Center, Logistics Studies Office Project No. 309.

3. Quantities and basic components of food in the ration should be guaranteed to meet recognized standards of nutritional feeding and should not be subject to a gradual decline as the cost-of-living increases or the availability of funds decreases.

4. DoD must be protected from pressure groups and lobbies that may endeavor to increase military use of this or that food to the detriment of accepted nutritional standards.

It is also worth noting that when the services were placed under a uniform food allowance in 1967, the NRL was retained, thus indicating continuing acceptability of a statutory list of food components at that time. In the opinion of the URCS study team, the real value of the NRL is that it provides a visible, commonly understood reference or standard for military food service. It is concluded that such a standard serves a useful purpose. Whether or not the standard should be in the form of a list of components like that provided in the NRL or should take some other form will be discussed later.

The discussion will now be directed to specific characteristics of the NRL with the intention of focusing on those facets of the law and its administration that appear to be most capable of improvement.

**Current Food Utilization.** The principal reason for performing the extensive study[5] of current food utilization during the URCS program has been to evaluate the composition of the NRL and the FCI and, if required, to enable development of alternatives to these instruments. This effort has involved collecting data on issues to military dining halls of about 500 different food items (identified at the federal stock number level) served by the four services on a per ration basis in a sample of almost 37.5 million rations. These data have further been aggregated into various food groupings. From this compilation it has been possible to assess to what extent current food purchasing practices are in line with the NRL food components. The results of this comparison clearly indicate that current food usage varies appreciably from the food types and quantities in the law. In this analysis it is shown that DoD food usage differs from the corresponding NRL allowances (as expressed in the FCI) by more than 20 percent in 7 of 12 conventional food groups. In considering why such variations can exist, it must be remembered that the NRL is over 40 years old. In setting forth the rationale in 1933 for revising the food components in the 1906 law, the Secretary of the Navy[6] cited major changes that

[5] Brandler, P. and Deacon, R., "Patterns of Food Utilization in the DoD, Volume 1", U.S. Army Natick Laboratories Technical Report 75-65-OR/SA.

[6] Secretary of the Navy letter to the Speaker of the House of Representatives, dated 21 January 1933, contained in House of Representatives, 72nd Congress, Report No. 1958, entitled "To Effect Needed Changes in the Navy Ration", 2 February 1933.

had occurred in tastes, working and living conditions, manufacturing methods and food preservation, and better knowledge of nutrition. Certainly changes in these factors between 1933 and 1974 have also been dramatic. In terms of food usage, at the time of the 1933 revision the NRL was tolerating issue vs allowance differences of as much as 30 percent in the meat group, 57 percent in vegetables and 78 percent in fresh fruit. The 1974 food utilization study shows that large differences of this sort also exist now, and it is concluded that the need for change of the components of the 1933 law in 1975 is similar to the need for amending the 1906 law in 1933.

**Inflexibility.** One of the distinctive features of the NRL mentioned previously in this section is the flexibility which is permitted by its "over and under clause". The differences in actual food issues vs NRL food allowances that have been mentioned above derive from the existing interpretation and application of this clause, thus leading to the observation that the exception within the law has largely become the rule. Nonetheless, it is noted that the clause as phrased restricts shifts in issues to those occurring **between articles.** Thus, the law can be interpreted to constrain food purchases to those specific and generic food components listed in articles and to preclude other types of foods. An example of such an interpretation is evidenced in the Navy's stand that the law does not permit it to substitute margarine for butter in enlisted messes. Presumably the only permitted substitute for an under issue of butter would be an over issue of some other component in the articles, and margarine is not so listed. If this position were applied to food utilization in general, it is observed that it could be used to prohibit issuance and use of many foods which are popular and which are used in reasonably large quantities. Examples of such foods are carbonated beverages, cake mixes, and ice cream. It is further noted that certain forms of food, such as frozen or other convenience items, are not mentioned in these articles. The point of this discussion is not to suggest that unlisted food items should be prohibited but rather to indicate that in some cases their use is of questionable legality under the NRL, appearing to require legal interpretation on a case-by-case basis as a minimum. The lesson to be learned for design of a URL is to avoid these types of problems if possible. As a general guideline, the law should permit use of any DoD authorized foods that meet changing operator and consumer needs.

An additional problem of inflexibility in the NRL is created by the fact that four of the articles (butter, cheese, eggs, and sugar) list only one food item. While these foods can be, and often are, over or under issued, the difficulty that arises is that the FCI components are made to agree exactly with the law. Thus, even though considerably more than 1.2 eggs are purchased for the average ration, the present system does not permit the FCI to be adjusted to a more appropriate quantity. Therefore, the FCI is not as representative of food utilization as it might be. In the case of NRL articles which are more broadly stated ("e.g., two ounces of cocoa or two ounces of coffee or one-half ounce of tea"), greater flexibility is possible in designing the FCI to approximate the actual utilization patterns.

The above stated inflexibilities of the NRL were indicated in the report of an interservice task group[7] that reviewed the FCI in early 1972. Extracts from that report follow:

> "The Committee's review of the Index and Navy Ration Law allowances reaffirmed that listings of additional convenience foods and quantitative increases/decreases would require that changes be made in the basic Ration Law allowances."
>
> "While some increase in the Section 6082, Title 10, U.S. Code allowance for eggs (1.2 eggs per ration) would be desirable, this increase and the addition of a greater variety of formulated and convenience foods to the FCI are not feasible under the presently prescribed ration entitlement."

One of the recommendations of this program (Section VIII) is to establish a standing URCS Committee to act on all ration cost system matters, such as revisions of the FCI. It is concluded that the ration law should be developed so as not to restrict the professional efforts of this task group in ways such as occurred in the previous review effort. In other words, the ration cost system should facilitate official review and revision rather than inhibit it.

**Nutritional Standards.** In considering the nutritional basis for the composition of the NRL, available information indicates that the last revision of the NRL in 1933 was done in part to reflect "the principles of scientific feeding" as related to "the maintenance of health". Since it is well known that the state of knowledge in the nutritional field has progressed appreciably since 1933 and that today's Daily Dietary Allowances did not exist then, it is desirable to examine the current NRL in this area today. However, the very nature of the NRL precludes a direct and precise comparison of the nutrition provided by the NRL components with nutritional standards since some of the components are expressed in generic terms (e.g., ounces of "meat") and others offer a choice of foods (e.g., ounces of cocoa or coffee or tea). Thus, in order for an allowance vs standards analysis of nutrition to be performed, it is necessary to convert the NRL components into specific foods. The FCI provides such a conversion, and an analysis will be made later in this section of the nutrition provided in the ration which is defined by the FCI. An issue that will subsequently be discussed in a later section is whether nutrition is better addressed by a list of generic food components in a ration law or by inclusion of some other form of reference.

[7] "Proposed Revision of DoD Food Cost Index", Memorandum for Chairman, DoD Food Planning Board, U.S. Navy Subsistence Office letter serial FSI 4061/6, 15 March 1972.

**Consumer Orientation.** The basic question here is whether the food components of the NRL reasonably represent the consumer's requirements (i.e., food preferences). This question is directly related to the morale of enlisted personnel. One of the major reasons stated for amending the NRL in 1933 was to make the food components in the law more consistent with the tastes in food and the character of duty and the service environment at that time. The degree of change required in the law was determined by comparing the rations allowed by the law with those actually being issued. The rations issued were thus viewed as being representative of what the enlisted consumer preferred. This viewpoint is based on the premise that within economic constraints and his own motivational interests the dining hall manager will normally serve those foods that are most popular. This premise is, however, questioned and discussed in Section VI.

As indicated previously, a similar comparison of NRL allowance versus food issues has been performed for the current time period. This analysis has been based on the DoD food utilization study conducted as part of the URCS program. The analysis has revealed generally poor to medium agreement between utilization data and present allowances. While this comparison is rather coarse in that it involves the total weights of food items in a limited number of basic food groups, it does lead to the conclusion that changes in the items and quantities in the NRL components are required to bring the law into line with current day food usage. A more quantitative analysis of this issue will be found later in this section under the FCI discussion. Also, later in the report an approach is suggested in which the extensive survey information compiled in recent years on the inherent food preferences of military personnel is used (rather than utilization data) to amend the ration law and make it even more consumer oriented.

**Structure, Terminology and Content.** A review of Section 6082, Title 10, U.S. Code, has identified a number of improvements that are possible in the current wording and composition of the ration description. This review has gained appreciably from comments received from the four services, particularly informal responses by the chief dieticians of each service to a URCS survey on this subject.

The first area of interest is the food group structure of the ration as described in Section 6082. As shown in Figure 3, the NRL allowance currently consists of 14 articles, each of which represents a food component category (e.g., meat, vegetable, milk). While the continued use of these 14 groups can be workable if suitable changes are made in the specific foods that are listed, improvements can be achieved by adopting a new grouping structure. A number of alternative approaches to food groups have been investigated, including:

- the Veterans Administration system of four major food groups and one miscellaneous group

- the URL proposed in the 1955–58 period, consisting of 16 component food groups

- A U.S. Department of Agriculture (USDA) system of 11 food groups

- The Federal Bureau of Prisons standard ration consisting of 16 major food categories

In addition, a range of other food group structures in use by foreign military and other U.S. institutions (see reference 3) has received consideration. If the use of a ration law with listed components is continued, the results of this review lead to the following conclusions: 1) the food groups should be broadly defined so as to include all types of food, cover new methods of food processing, and avoid having to resort to legal interpretation, 2) to the extent practicable, groups consisting of only one food item should be avoided (this appears feasible in all cases except eggs), 3) the Veterans Administration system of five groups is too broad, but the USDA and previously proposed URL groupings are representative of efficient group structures, and 4) the selection of food groups is a judgmental matter, best performed by professional dieticians. It is felt that final decision in this area should be reserved for the standing URCS Committee which this program has recommended be formed to act on future ration cost system matters. As a particular recommendation to this committee, the following major food groups, which are based primarily on the USDA groups and which have been utilized in a portion (see reference 5) of this program, are proposed:

1. Meat – Poultry – Fish
2. Eggs
3. Milk and Milk Products
4. Beverages
5. Vegetables
6. Legumes and Nuts
7. Grain and Cereal Products
8. Fruits
9. Fats, Oils, Salad Dressing
10. Sugar and Sweets
11. Condiments
12. Miscellaneous

For purposes of analysis in the URCS program, these 12 major groups have been further subdivided into 51 minor groups. While the point of this discussion is to indicate the potential to improve the current NRL food groupings, it must also be mentioned that approaches for a URL other than strictly a revision to the present NRL format will be proposed and evaluated later in this report.

The terminology of the NRL components is also in need of improvement since the words used derive from phraseology employed in 1933. For example, a substitute quantity should be introduced in place of "gills of oils or sauces or vinegar". The current listings do not include the boneless meat equivalents or certain commonly used food forms, such as frozen. Based on recommendations from service dieticians, certain other terminology changes should also be considered. For example, the following foods currently included in the components are candidates for replacement with more modern food items: biscuit, preserved meat, salt meat, powdered fruit juice, starch foods, and lard or lard substitutes.

If the law is retained in its present form, a number of changes in technical content (types and quantities of food components) are indicated, including replacements for the items listed above. Based on this review, some of the foods deserving serious consideration for inclusion in a revised list of components include: cake mix, boneless meat, fish fillets, cut up chicken, boneless turkey, dehydrated vegetables, frozen fruits and vegetables, carbonated and non-carbonated beverages, ice cream, margarine, pasta, and shortening. In components in which more than one type of item is listed, the per component quantities that are specified should be equivalent; for example, it has been pointed out by one service that the quantities currently in the first article (biscuit, soft bread, and flour) are not equivalent. Further, changes that inexorably occur over a period of years in methods of preservation and processing suggest either the need for eliminating references to such methods or more frequent review and revision of the law. The quantities of some components need modification; milk, for example, requires an increase in allowance from the current one-half pint, and this has already been done by the current DoD Appropriation Act. Other quantity changes that have been suggested include increasing the number of eggs and reducing the amount of coffee.

The preceding summary observations about the structure, terminology and content of the NRL do not represent an exhaustive review of Section 6082 but are intended to establish that the ration as described in that Section does have deficiencies and is capable of improvement. Certain improvements such as food group nomenclature should derive from professional judgment based on the state-of-the-art, and others such as the types

and quantities of the food components should be based on quantitative data reflecting current feeding practices. However, it is inadvisable to revise the NRL within its current components structure without first addressing the major question of whether the components presentation or some other type of format is preferable. Therefore, this question is raised and examined in Section VI.

**Translation Into a FCI.** Although the NRL has general value as an underlying, difficult-to-change, general basis for the military feeding program, its principal use is its role as the basis for the FCI and hence for determining the cost of the ration. In spite of this important linkage between the NRL and the FCI, a linkage affecting millions of dollars of subsistence funds annually, there is no legally documented method for translating the NRL into the FCI. Further, relevant DoD regulations (DoD 1338.10–M and DoD Directive 1338.10) do not broach this important subject. In fact it may be noted that the law does not even mention an index.

The use of indexes for determining the cost of the daily food allowance has been followed by the services for an appreciable period of years, but prior to 1967 a variety of indexes were in use within DoD. Further, the Navy and Marine Corps used appreciably different indexes which were also costed in different ways, even though both services were subject to the NRL. Based on a review of correspondence on the subject and on discussions with food service headquarters personnel in the military departments, it has been determined that the current procedure for deriving the FCI from the NRL is as follows:

1. The food items and quantities in the FCI should equate to the food components and quantities prescribed in the articles of Section 6082.

2. The items used in the FCI should be most representative of those used by the services within the foods covered by each NRL article.

3. The quantities of the food items selected for the FCI should be approximately proportionate to the total service consumption of the NRL article accounted for by those types of items.

Without going into further detail, this general approach seems logical and defensible as an approach to constructing a FCI. However, it does need to be emphasized that it is neither the only reasonable approach that could be used nor is it required that it be carried out in exactly this fashion.

Because the method for deriving the FCI is not fixed by law or regulation, there is actually a great deal of flexibility legally permitted in selecting FCI items and quantities within the wording of the NRL articles. If the least and most costly foods meeting the article definitions in the law are inserted in the FCI, the monetary value of the BDFA varies widely. A specific example of this possible BDFA variation is provided later in this Section in the FCI discussion. The difficulties of wording the articles in a ration law to avoid this type of problem, while simultaneously seeking to avoid the inflexibility mentioned previously, are discussed in Section VI.

It is generally accepted that the NRL provides protection against changes in the FCI which represent departures from the articles of the law. However, because of the above-mentioned latitude that may be considered to exist in defining the FCI from the NRL, the amount of protection provided may reside more in the desire of all interested parties to provide an acceptable ration than in strictly legal terms. It is concluded from this review that it would be desirable for a new uniform ration cost system to specifically address the method to be used in making the translation between the feeding standard contained in the URL on one hand and the composition of the FCI on the other.

**Nature of the Control Provided.** In view of the statutory status of Section 6082, it is well to understand how it operates as a control. A basic question is whether there are any procedures that are followed to ensure that the daily food entitlement is received by the individual enlisted member. In terms of actual information on food utilization, only the Navy and Marine Corps collect data centrally at service headquarters on the types and quantities of food purchased by all units. While this data may be examined for reasonableness, there is no indication that it is checked in a rigorous and routine fashion against the ration entitlement in the NRL. Nor is this done at the local level in any service. Moreover, any such evaluation would be complicated by the law's over and under issue clause, and the law, because of this clause, may be virtually unenforceable in terms of specific food usage without a stifling amount of paper work. Nonetheless, all services do routinely monitor the per ration cost of food at the unit accountability center (e.g., a ship) and control this cost relative to the current value of the BDFA. Accountability is simplified by the fact that these food funds are designated ("protected") for subsistence only, and the local commander does not have the freedom to make "butter or bullets" types of decisions about their usage. Overall, it is observed that the control that is indirectly provided by the NRL is in terms of food costs only and that the food entitlement as expressed in the NRL articles is not enforced. The URCS study team concurs that this control by cost is, in fact, the simplest, most logical approach to providing the legal entitlement to the enlisted member. However, the fact that the law is actually providing a basis for a cost standard and not an enforced food type and quantity standard, as is indicated by the wording of Section 6082, is not always recognized. This observation has significance because it leads to consideration of other forms of cost standards for use in a URL.

**Standard of Feeding.** The NRL serves to set the quality of feeding by virtue of its effect on the FCI and the monetary value of the BDFA, but how is it determined that this daily per person food cost is suitable? That is, how is it known whether the funds specified for the daily purchase of food for military personnel are low, high or just right? From a brief review of ration history, it appears that the current and previous military standards of feeding have derived from studies by the military services of the type and amount of food required to sustain the service member. Unquestionably these studies have considered contemporary military eating habits and, so far as they were known at the time, nutritional requirements. Indications are that the state of food technology and the costs to the government have also affected food allowances. The food needs so defined have then been translated into cost terms. Generally then, the standard of feeding established by the NRL, and by other laws and regulations that have served a similar function in the past, derived from professional judgment of the needs of the enlisted person. This "inward" look is understandable, but so far as can be determined there has been little effort to compare the quality of military feeding with that experienced in appropriate segments of civilian life. Such an appraisal is made somewhat difficult by the fact that civilian organizations are not exactly comparable to the military. Nonetheless, there has been a clearly discernible trend in recent years to seek to place military pay and allowances on an equitable basis with US community standards. A specific example of this is the Pay Comparability System (Sections 5301-5308, Title 5, US Code) which currently results in annual adjustments to military pay and benefits based on wages and salaries for the same levels of work in the civilian sector. In keeping with this approach and policy, it is recommended that the military standard of feeding be based on the level of feeding experienced by comparable organizations in US civilian life. This can be accomplished in an explicit fashion by periodically setting the ration cost standard in the URL on the basis of a quantitative analysis of comparably determined costs in the civilian area. This action will serve a number of purposes, including providing a more defensible basis for requesting military subsistence appropriations from the Congress.

**Uniform Application of the Ration Law.** Even though it affects all services by virtue of its effect on the FCI, the NRL actually applies directly only to the Navy Department. As a result, a situation sometimes occurs in which the Navy Department unilaterally provides interpretations of the law (specifically Section 6082) which affect all services. The Army and Air Force Ration Laws are not operationally applied. A preferable and more equitable arrangement would be to have a single ration law which applies uniformly to all of DoD. Concomitantly, the name of the statute should become the Uniform Ration Law.

**Review of the Ration Law.** There are no statutory or otherwise documented requirements for periodic review of the NRL. As a result, the last two modifications of any significance occurred 42 and 69 years ago, respectively. Even though military food service has been able to operate under the NRL, the preceding discussion indicates that the law should have been revised more often to incorporate improvements and thus

to facilitate management of the system. To provide a definitive approach for ensuring its continuing currency, it is recommended that the URL contain a requirement that it be reviewed periodically (e.g., every four years).

**Ration Entitlement.** The NRL in Section 6081 states that each enlisted member "is entitled to a Navy Ration for each day that he is on active duty, including each day that he is on leave". DoD 1338.10–M further states than "an enlisted member may be served any combination of meals in a day which is equivalent to the daily food allowance". In each of these entitlement statements it is observed that entitlement is placed on a daily basis, and an individual is legally permitted to take the full entitlement in a single meal or two. Thus, the entitlement statement supports the past and current DoD emphasis and practice with respect to allowing second helpings during a single meal period. While this may prove a satisfactory arrangement for the individual, it can work to the disadvantage to the dining hall and its regular customers, although it may possibly save the government money. This can occur because under present ration cost procedures the dining hall can receive credits of no more than 40% of the monetary value of the BDFA from the government for the attendance of one person at a meal (and only 20% for the breakfast meal). If in fact the customer takes food costing more than 40% of the BDFA, then the dining hall in effect is "taking in" less than it is"paying out" for the raw food. This necessitates making up for such losses in some other way, probably at the expense (e.g., serving lower cost foods) of other persons using the hall. This becomes a real problem only if it occurs with some frequency. However, considerable data exists which demonstrates that the average military consumer who receives meals as a part of his pay and is not in a captive feeding system (e.g., recruit training) attends less than 1-1/2 meals per day and therefore has considerable opportunity to obtain all or most of the statutory daily entitlement during the meals attended. The cost "gap" problem is probably further aggravated by the increased attendance at certain higher cost meals (e.g., steaks).

Many experienced food service managers consider this to be a significant operating problem, but the magnitude of the overall problem in quantitative terms has not been fully analyzed. Nonetheless it is the opinion of this study that methods for providing relief, such as by furnishing extra credits when seconds are taken, need to be considered and introduced.

**Total System Cost-Benefits.** The NRL and the associated directives are almost entirely concerned with the cost of food only. However, the total cost of providing military food service involves not only food but also military and civilian labor, facilities, equipment, supplies, and a number of other operational costs. The desirability of considering total food service costs in managing the system has been recommended by many previous reviews and studies. In considering the content of a URL, it is concluded that the URL should take the first meaningful step legally permitting food costs to be viewed in a total system context, and this matter is addressed in this report. Such an approach would, for example,

potentially permit a higher BDFA for a specific type of food service system in which other savings (e.g., labor) would at least offset the increased cost of food.

## THE FOOD COST INDEX: STUDY FINDINGS

### BACKGROUND

The present structure of the food cost index was first adopted by the four services in April 1967. Prior to that time all services had utilized indexes to compute the daily monetary value of the ration, but the approaches had varied appreciably. The Army and the Air Force used the 39 food items (components) listed in Executive Order 5952 of 23 November 1932. This list of 39 items was costed monthly using current Defense Supply Agency (DPSC) food prices. The Navy and Marine Corps indexes were both based on the 14 "articles" (ration components) of the Navy Ration Law but varied considerably in format. The Navy employed a list of 250 food items selected on the basis of the frequency with which the items had appeared in typical Navy menus in the past. This index list was costed quarterly using a Navy Subsistence Office standard price list which differed to some extent from the DPSC list. The Marine Corps, on the other hand, used a list of 47 specific food items which had been developed based on food purchase experience. This list was costed monthly using current DPSC prices.

With the formation of the Directorate of Food Service Management within the Office of the Assistant Secretary of Defense (Installation and Logistics) in 1967, the recognized need for a common method to be used by the services in computing the daily monetary value of the ration (BDFA) was acted on. The new FCI was made to conform to the provisions of the NRL, and in the developing the index and in coordinating it with the services, consideration was given to all previous indexes, existing Master Menus, and food usage experience data, as well as indexes developed by the Bureau of Labor Statistics in recommending Uniform Ration legislation for DoD in 1955. The new index consisted of 49 food components and contained an additional cash allowance for condiments equal to $1.50 per 100 rations. The 1967 FCI is still in effect basically as designed; however, it has been revised to offer options for the bacon, pork, and chicken components, a new basis for determining the cash allowance for condiments, new item listings and grades for the beef allowance and standardized stock numbers for the components. A joint service task group chaired by the Navy reviewed the FCI in early 1972 and recommended a number of changes which at that time were estimated to add $0.075 to the cost of the ration. To date this FCI has not been adopted, but it is scheduled to become effective in FY1976. The current FCI is shown in Figure 4.

FIGURE 4

INDEX FOR COMPUTING THE MONETARY VALUE OF THE BASIC DAILY FOOD ALLOWANCE

MONTH/PERIOD:

| COMPONENT | | | UNIT | QUANTITY PER 100 | UNIT PRICE | VALUE OF COMPONENT |
|---|---|---|---|---|---|---|
| BACON, Slab, Sliced | 8905-403-9592 | | lb | 7.00 | | |
| BEEF, Boneless, Grill Steak | 8905-151-6586 | | ' | 10.17 | | |
| Pot Roasts | 8905-151-6585 | | ' | 12.02 | | |
| Ground frz | 8905-285-2075 | | ' | 12.025 | | |
| Patties | 8905-935-3268 | | ' | 12.025 | | |
| HAM, Smoked, Boneless | 8905-682-6643 | | ' | 6.30 | | |
| PORK, Roast, Boned | 8905-753-6568 | 50% | ' | 8.74 | | |
| PORK, Slices, Boned | 8905-753-6569 | 50% | ' | | | |
| CHICKEN, RTC, Cut-up | 8905-965-2128 | | ' | 11.54 | | |
| FISH FILLET, Flounder | 8905-164-0490 | | ' | 4.00 | | |
| BUTTER, Fresh, Patties | 8910-782-3195 | | ' | 10.00 | | |
| CHEESE, Cheddar, Natural | 8910-125-8440 | | ' | 3.125 | | |
| EGGS, Fresh, in Shell | 8910-043-3198 | | doz | 10.00 | | |
| APPLES, Fresh, Eating | 8915-126-8812 | | lb | 17.00 | | |
| BANANAS, Fresh | 8915-126-8748 | | ' | 5.00 | | |
| ORANGES, Fresh | 8915-616-0212 | | ' | 18.00 | | |
| CABBAGE, Fresh | 8915-616-0194 | | ' | 14.75 | | |
| CARROTS, Fresh | 8915-127-8019 | | ' | 13.00 | | |
| CELERY, Fresh | 8915-252-3783 | | ' | 12.00 | | |
| LETTUCE, Fresh, Head | 8915-117-3358 | | ' | 13.00 | | |
| ONIONS, Dry | 8915-616-0200 | | ' | 15.00 | | |
| POTATOES, White, Fresh | 8915-616-0220 | | ' | 98.00 | | |
| TOMATOES, Fresh | 8915-582-4059 | | ' | 13.00 | | |
| LARD, Svc, or Shortening GP | 8945-616-0091 | | ' | 10.00 | | |
| APPLES, Canned | 8915-126-4060 | | ' | 5.25 | | |
| ASPARAGUS, Canned | 8915-286-8696 | | ' | 3.00 | | |
| BEANS, Green, Canned | 8915-616-4820 | | ' | 8.25 | | |
| CHERRIES, RSP, Canned | 8915-286-5486 | | ' | 4.00 | | |
| CORN, Whole Grain, Canned | 8915-257-3947 | | ' | 7.50 | | |
| JUICE, Orange, Canned | 8915-241-2800 | | ' | 1.875 | | |
| JUICE, Pineapple, Canned | 8915-634-2439 | | ' | 1.875 | | |
| JUICE, Tomato, Canned | 8915-255-0523 | | ' | 3.75 | | |
| PEACHES, Sliced, Canned | 8915-577-4203 | | ' | 3.25 | | |
| PEARS, Halved, Canned | 8915-616-0223 | | ' | 2.25 | | |
| PEAS, Green, Canned | 8915-127-9282 | | ' | 6.125 | | |
| PINEAPPLE, Sliced, Canned | 8915-170-5148 | | ' | 4.00 | | |
| TOMATOES, Canned | 8915-582-4060 | | ' | 14.50 | | |
| FLOUR, Wheat, Hard | 8920-125-9423 | | ' | 37.50 | | |
| NOODLES, Egg | 8920-126-3388 | | ' | 2.00 | | |
| RICE, Parboiled | 8920-530-2185 | | ' | 3.00 | | |
| SPAGHETTI | 8920-125-9441 | | ' | 3.00 | | |

FIGURE 4 (Cont'd)

INDEX FOR COMPUTING THE MONETARY VALUE OF THE BASIC DAILY FOOD ALLOWANCE

MONTH/PERIOD:

| COMPONENT | | UNIT | QUANTITY PER 100 | UNIT PRICE | VALUE OF COMPONENT |
|---|---|---|---|---|---|
| SUGAR, Granulated | 8925-127-3074 | ' | 31.25 | | |
| JAM, Strawberry | 8930-197-1917 | ' | 1.875 | | |
| JELLY, Grape | 8930-127-3079 | ' | 1.875 | | |
| OIL, Salad | 8945-616-0081 | ' | 2.8875 | | |
| CATSUP | 8950-127-9789 | ' | 4.76 | | |
| VINEGAR , Cider or | 8950-221-0297 | ' | 3.1725 | | |
| VINEGAR, Wine | 8950-616-0213 | ' | 3.1725 | | |
| COCOA, Natural | 8955-223-5806 | ' | 3.125 | | |
| COFFEE, R&G | 8955-286-5372 | ' | 9.375 | | |
| CEREAL, Cornflakes | 8920-125-8447 | ' | 2.00 | | |
| BREAD, White, Plain | Current lb Price | lb | 37.50 | | |
| MILK, Whole, Fresh | | Pint | 200.00 | | |

SUBTOTAL: _____

CONDIMENTS and ACCESSORY FOODS, add 2% of Subtotal _____

VALUE OF THE DAILY FOOD ALLOWANCE FOR 100 PERSONS

PLUS VALUE OF AUTHORIZED SUPPLEMENTAL FOOD ALLOWANCE _____

GRAND TOTAL: _____

VALUE OF THE DAILY FOOD ALLOWANCE FOR ONE MAN _____

NOTE: The components contained in this index and the quantity per 100 persons are derived from Section 6082, Title 10, United States Code. The milk component is increased from the basic allowance contained in Section 6082, Title 10, United States Code pursuant to the authority contained in the current Department of Defense Appropriation Act.

## ANALYSIS OF THE FOOD COST INDEX

**The Need for an Index.** The previously mentioned study of ration cost systems utilized by other institutions has shown that the use of food cost indexes (often called ration scales) is quite common in both the US and in other countries. This is generally true whether the institution uses a monetary or food control type of system (see Section IV). The general acceptance of the FCI concept derives from the fact that it provides a visible, official standard of feeding for both administrators and users. Further, the index is used in most systems in such a way that a "constant" level of feeding is provided independent of food price fluctuations. These purposes of a FCI are valid and important, and since no better way of handling these factors has been identified, the continued use of a FCI in the URCS is recommended.

Many of the deficiencies of the present FCI stem directly from its relationship with the NRL. Because most of these problem areas have been commented on in the discussion of the NRL, they will only be mentioned briefly here.

**Current Food Utilization.** The previously referenced study [5] of current food utilization within the four services has provided a quantitative basis for evaluating the composition of the FCI. As shown in Table 1, this evaluation establishes a good indicator of current usage vs FCI allowances. The data here have been analyzed on the basis of common food groups but comparable differences can be found on an item by item basis.

TABLE 1
COMPARISON OF DOD FOOD UTILIZATION
VS. FOOD COST INDEX QUANTITIES
(Basis: pounds per ration)

| Food Group | Ratio of DoD Usage to FCI Quantities |
|---|---|
| Meat, Poultry, Fish | 1.17 |
| Eggs | 1.83 |
| Milk and Milk Products | 0.92 |
| Beverages | 1.79 |
| Vegetables | 0.55 |
| Legumes and Nuts | 1.10 |
| Grain & Cereal Products | 0.85 |

TABLE 1

COMPARISON OF DOD FOOD UTILIZATION

VS. FOOD COST INDEX QUANTITIES (cont'd)

(Basis: pounds per ration)

| Food Group | Ratio of DoD Usage to FCI Quantities |
|---|---|
| Fruits | 0.77 |
| Fats, Oils & Salad Dressings | 1.24 |
| Sugar & Sweets | 0.73 |
| Condiments | 1.58 |
| Miscellaneous | — |

It will be noted that actual usage is within 10 percent of the FCI quantities in only two of the groups, milk and milk products and legumes and nuts. Usage in certain groups (for example, eggs, beverages, and fruits) varies appreciably from FCI allowances. The meat, poultry, fish group comparison shows usage to exceed the allowance by 17 percent; the impact of this in economic terms is quite large since this group represents about 44 percent of the total cost of the ration. Since, as explained earlier, the operative control on total food purchases is a monetary limit, the net effect of the over purchase of one food type is to require compensating under purchase in one or more others.

Although the food utilization study has provided a consistent basis for this actual usage vs allowance comparison, appreciable differences in "planned" usage vs the FCI allowances can be discerned by similar comparisons of pounds per ration data from the recapitulations of recent Armed Forces 42 Day Menus. Further, this type of deficiency in the FCI was recognized by OASD (I&L)[8] and by the joint service task group[9] at the time of the FCI revision in early 1972. The recommendations of that task group addressed this problem within the constraints imposed by the NRL (Section 6082) and with due consideration for the fact that food service system differences and feeding patterns in the individual services do not permit one FCI to agree with the consumption patterns of each individual service.

[8] Welbourn, J.L., Lt. Colonel, VC, USAF, Memorandum for Navy Member, DoD Food Planning Board, Subject: Proposed Revision of DoD Food Cost Index, December 1971.

[9] Davis, A.S., Captain, SC, USN, Memorandum for Chairman, DoD Food Planning Board, Subject: Proposed Revision of DoD Food Cost Index, March, 1972.

In summary, in the current DoD system the food components and quantities of the FCI are used to determine the cost of the ration, and the local dining halls have virtually complete freedom in purchasing food to serve so long as they observe the cost limitation. To be most operationally suitable, the FCI should be reasonably consistent with current food utilization patterns, a condition that does not currently prevail. Data now exist which provide a basis for better achieving this needed agreement, and it is recommended that a modified FCI based on this data be developed as soon as practicable. Until this is done, dining facility managers must adjust to food prices which differ from the price changes used in computing the current BDFA. This will be corrected when the funds provided are more consistent with funds required to purchase the foods actually used.

**NRL Constraints.** In revising the FCI, it should be recognized that some desirable modifications can not be accomplished without modifying or eliminating the constraints that result from the wording of Section 6082. Therefore, if an NRL type of ration law is retained, the following changes in the law should be made to provide a better overall FCI.

- Permit the purchase of all foods currently acceptable within DoD, rather than continue wording which specifies restriction of usage to those items in the NRL articles.
- Eliminate single item articles in the NRL.
- Change NRL food group structure, terminology, and types and quantities of listed foods.

Since these types of changes have been commented on in the previous NRL analysis, they will not be further discussed here. It is to be noted, however, that in considering improvements in the NRL, one can take the approach of either changing the NRL in its present form or of eliminating the need for article by article changes by adopting an entirely different format (i.e., a new type of feeding standard) for the law.

**Consumer Orientation.** Bringing the FCI into agreement with food utilization patterns will be an important step in designing a URCS that is more consumer oriented. A better approach to achieving this type of orientation is to take advantage of the body of food preference data that has been collected[10] in recent years. This information contains the customer's views of his particular likes and dislikes, and thus it more directly reflects his preferences than does the DoD food utilization data. There appears to be attractive

[10] Meiselman, H., et al, "Armed Forces Food Preferences", US Army Natick Development Center Technical Report 75-63-FSL.

potential in developing reference menus based on the stated menu item preference of armed forces personnel (subject to relevant cost and nutritional constraints) and then basing a new FCI on the recapitulation of such a menu. In view of its direct relationship to "known consumer requirements" (see study objectives), this approach has been actively considered as a basis for a FCI during this study.

**Nutritional Standards.** An analysis of the current FCI indicates that it meets all of the minimum requirements of the DoD nutritional requirements.[11] In fact, it considerably exceeds the recommended Daily Dietary Allowances (DDA), thereby allowing for nutrient losses in cooking and serving and in plate wastage. Generally, the approach to designing the FCI in the past appears to have been to give primary consideration to NRL allowances, cost factors and to estimates of food usage patterns. The resultant FCI is then analyzed from a nutritional standpoint to ensure that minimum requirements are observed. In view of the increasing interest in and knowledge of nutrition, it would be desirable to be able to achieve a more direct and planned relationship between the FCI and the nutritional standards existing at the time. This could be done, for example, by solving for a FCI that yields the approximate individual DDA nutrient values. This approach would not only result in a design to the required minimums but also to the desired maximums applicable in the case of fat, certain vitamins considered to be toxic in large quantities and possibly cholesterol. Research in progress indicates that computer analysis can be applied successfully to this kind of approach, although additional development is required.

**Relationship to the NRL.** The previous discussion on the NRL pointed out that the statute does not prescribe a specific means of deriving the FCI. The result is that disagreements arise on this issue. Correspondence between an interservice task group (chaired by the Navy) and OASD (I&L) in February and April 1974 illustrated such a lack of agreement. On 10 April 1974, an OASD (I&L) memorandum to the services stated that

> "Since the NRL is not specific as to all individual items, quality or package size, there is virtually an infinite number of indexes and BDFAs that can be derived therefrom as evidenced by previous revisions and proposed revisions to the index. The BDFA is a monetary term and has always been constrained by monetary limitations."

[11] "Nutritional Standards", Army Regulation No. 40-25, BUMED Instruction No. 10110.3D, and Air Force Regulation No. 160-95.

and

> "The use of a specific Index and BDFA is subject to negotiations within DoD based on overall requirements and limitations and is uniform for all Services."

In view of the role of judgement in deriving and changing the FCI, the fact that the system operates as well as it does speaks well for the understanding and sense of fairness that exists at both service and OSD levels. As mentioned previously and as an example of what could result if the NRL allowances are provided by a FCI with very low or very high cost foods, it was found that the BDFA could vary from $1.20 to $5.37 based on the use of June 1974 DPSC prices (at that time the actual BDFA was about $2.24). While neither the low nor high end of this range represents a realistic DoD monetary allowance, the example does illustrate the nature of this potential problem and indicates the need for a clear statement as to how the FCI should be developed. Until such a procedure is defined, the protection that the NRL is considered to provide the enlisted member must be considered somewhat tenuous. It is the consensus of the URCS study team that such a procedure should be clearly stated but not highly detailed. Approaches will be described in this report.

**Review of the FCI.** There are currently no directives that require that the FCI be reviewed periodically. In view of its importance and because of the continuing changes in food technology, food service systems, food preferences and usage patterns, the index should be reviewed frequently (recommended annually) by a standing committee designated for this purpose. A similar review in the Australian Armed Forces occurs every six months. The freedom and constraints that apply to the committee's recommendations for changing the FCI should be provided in suitable form, such as in DoD Directive 1338.10. Currently this directive states that the Assistant Secretary of Defense (Installation and Logistics) will:

> "Recommend changes to the food cost index to assure that it accurately reflects a value which will provide the basic daily food allowance. Required changes to the index will be coordinated with the military services."

The recommended changes are forwarded to the Deputy Secretary of Defense for action. The URCS study team makes the following observations on this procedure:

– the means for making recommendations for FCI changes to OASD (I&L) is not addressed. It would be desirable to make explicit the desired flow of information from the services through a standing URCS Committee to OASD (I&L).

– it would be more accurate to state that the index "yields" rather than "reflects" the required monetary value.

– the reference to providing the basic daily food allowance leaves considerable room for interpretation since the only requirement it introduces is to "provide a nutritionally adequate diet for one man for one day". The development of a more definitive statement merits consideration.

– in addition to coordination of FCI changes with the services, the changes also require routine coordination with interested OSD-level offices; namely, the Comptroller, DDR&E, Administration, Manpower and Reserve Affairs, and the General Counsel.

The last major revision of the FCI was recommended in February 1972 and is not due to be implemented until fiscal year 1976. It would be advisable to place limitations on the time permitted the reviewing offices to act on officially proposed FCI changes in order that such recommendations are promptly considered and decisions made without arbitrarily imposed delays.

**Frequency of BDFA Computation.** The FCI is costed using DPSC food prices once per month by all services except the Navy, which uses a quarterly computation. The review of other institutional ration cost systems during the URCS Study has determined that none change the ration value as often as monthly. Most consider quarterly changes. Two systems use a food control approach which provides basically the same types and quantities of food each accounting period independent of cost. The practicability of using a longer period for costing the FCI should be considered.

**Method for BDFA Computation.** A variety of methods are utilized by the services for costing the FCI to determine the value of the BDFA. These methods range from entirely local costing (Army, Air Force) to an all central costing approach (Navy) and include a combination of central and local costing (Marine Corps). All methods appear to work effectively in the current ration cost systems. Central costing appears to be the most popular method in the other institutional systems that have been surveyed. There is no current need for a common approach within DoD, but the greater use of ADP techniques in a future URCS may provide efficiencies in central determination of the BDFA, particularly under the concept of costing a reference menu.

## SUMMARY ANALYSIS: NRL AND FCI

This review has provided the following observations relative to the Navy Ration Law and Food Cost Index:

– The current ration cost system as implemented by the NRL and FCI has a number of assets, including its general acceptance within the services and the flexibility it permits in terms of the types of food service systems that can be provided to meet consumer needs at the "grass roots" level of operation.

– While a ration law is not essential to the operation of a ration cost system, within the military services the use of a law is traditional, well accepted and serves a useful purpose. A new URCS should retain a ration law which clearly establishes a standard of feeding.

– The concept of using a FCI in a ration cost system to provide a constant level of feeding independent of food price fluctuations and other perturbations is widely accepted and should be continued.

– The food types and quantities listed in the NRL articles and in the components of the FCI vary appreciably from the current utilization of food by the armed forces. Both the index and the law require modification to achieve consonance with food usage patterns.

– The NRL (Section 6082, Title 10, U.S. Code) is capable of improvement in a number of ways, including the structure of the food groups (articles), the terminology used and especially in its technical content (types and quantities of food components).

– The NRL is too inflexible because if it were enforced on a strictly legalistic basis, it would prohibit issuance and use of many popular foods that are now used in rather large quantities in military dining facilities. The URL should be designed to avoid this type of problem by setting a feeding standard in the law and then permitting DoD to introduce any authorized food items into the FCI as consumer preferences, food technology and other conditions change with the passing of time.

– On the other hand the NRL is too flexible, a condition resulting from the fact that there is no method prescribed in the law or in current regulations for deriving the FCI from the NRL. Because different FCI's yielding widely varying BDFA values can be constructed within the generic food component nomenclatures and quantities in the NRL, the NRL does not actually provide the ration protection that it is often credited with. This is a serious omission because of the importance of the FCI both in terms of food costs to the government and the satisfaction (morale) of the enlisted member. One method for coping with this problem is to make the ration law so specific that the FCI components and quantities are clearly defined. However, in an overall sense the very practice of inclusion of a list of food components in a law creates a paradox in that if the protection of the level of feeding is increased by making the list quite specific, then it becomes increasingly difficult to address the other objective of providing enough flexibility to keep the list consistent with changing customer preferences, service

requirements, and food service technology. These major problems with the existing NRL have formed a basis for the development and consideration of an alternative for the URL which provides both level of feeding protection and desired flexibility.

– Although the NRL indicates the ration entitlement in terms of food types and quantities, the law actually operates through the FCI to provide a food cost control. Thus, the law furnishes a basis for a cost standard rather than a food issue control. The study team concurs that a monetary control system is the better approach but recommends consideration of a more direct basis for establishing the cost standard in a URL.

– There appear to have been no studies to relate the level of military feeding (as established by the NRL and FCI) to that of comparable groups in US civilian life. There is, therefore, no comparative standard for determining the reasonableness of the monetary value of the ration as there is in the case of military pay.

– The nutrition in the ration entitlement of the NRL, as translated by the FCI, meets and exceeds the Daily Dietary Allowances of armed forces nutrition standards. This results from designing the ration allowance on the basis of broad food group representation rather than from any direct and analytically based connection between the NRL and modern day nutritional standards.

– The legal interpretation of the NRL has traditionally been performed by the Navy Department even though the law affects all services. The Army and Air Force Ration Laws serve no operational purpose. A Uniform Ration Law applying consistently to all services should be developed.

– There are no statutory or other requirements for periodic review of the NRL. Similarly, there are no directives that require the FCI to be reviewed on a scheduled basis. The organizational responsibilities and instructions for recommending and acting on revisions to the NRL and FCI should be more clearly stated.

– The NRL (Section 6082) expresses the ration entitlement on a daily basis rather than a meal basis, and the consumer can therefore receive the full entitlement in less than 3 meals per day. Dining halls allow seconds at a particular meal in keeping with this concept but can only receive ration credit for that one meal no matter how much food individuals may take. When a dining hall provides seconds, it should be allowed to obtain another signature and thus realize appropriate monetary credit for the food served. It is well documented that the average enlisted person (SIK) attends fewer than half his authorized meals; therefore, there is little chance that an individual will receive more than his entitlement.

– The NRL and FCI do not reflect the results of the substantial body of armed forces preference information that has become available in recent years. The use of this data to develop highly preference-oriented menus on which the FCI could be based offers attractive potential.

– There is no immediate need for a uniform approach in terms of central vs local computation for costing the FCI to determine the value of the BDFA. Future ration cost systems making greater use of ADP methods in ration control should realize benefits from centralized computation.

– The NRL, the FCI and associated directives are almost entirely concerned with food allowances and costs and do not address the issue of changing the ration entitlement (hence the FCI and the BDFA value) for particular food service systems in the interests of improving total system benefits with cost savings, or without increasing total system costs.

## SECTION III

## REQUIREMENTS FOR THE UNIFORM RATION COST SYSTEM

### GENERAL

The review of the current ration cost system in the preceding section provides a number of findings relative to the requirements for a URCS. In order to identify other desired features of a URCS, it is important to understand the role of the ration cost system in the overall process of providing food service for military personnel. This brief discussion will deal particularly with the relationship of the ration cost system to food service systems and food supply (logistics) systems. Figure 5 is provided as a means of introducing points of interest.

### FOOD SERVICE SYSTEMS

A food service system is defined as the combination of food service personnel, equipment, facilities, food items and associated support directed to providing meals for the military consumer. In addition to the obvious functions of food acquisition, preparation, serving and cleanup, the food service system is also normally concerned with menu planning, nutrition, food preferences, sanitation, training, accounting and reporting, and related activities. The major objectives of military food service, as suggested by DoD Directive 1338.10 "(Department of Defense Food Service Program)" and other military publications and as expressed in a variety of forms in study reports[12,13,14,15] are as follows:

[12] Peskin, H. and Dolins, L., "Military Food Ration Study", Institute for Defense Analyses Paper P-919, February 1973.

[13] "Development of a Format For a New Uniform Military Ration Law", PRC Systems Sciences Company Technical Proposal 0-10295, February 1971.

[14] "Reconnaissance Study — Subsistence Management", Logistics Management Institute Task 69-5, June 1969.

[15] Barrett, C.W., LCDR, USN (SC), "A Uniform Ration Law for the Armed Services", U.S. Naval Postgraduate School Thesis, AD 475392, 1965.

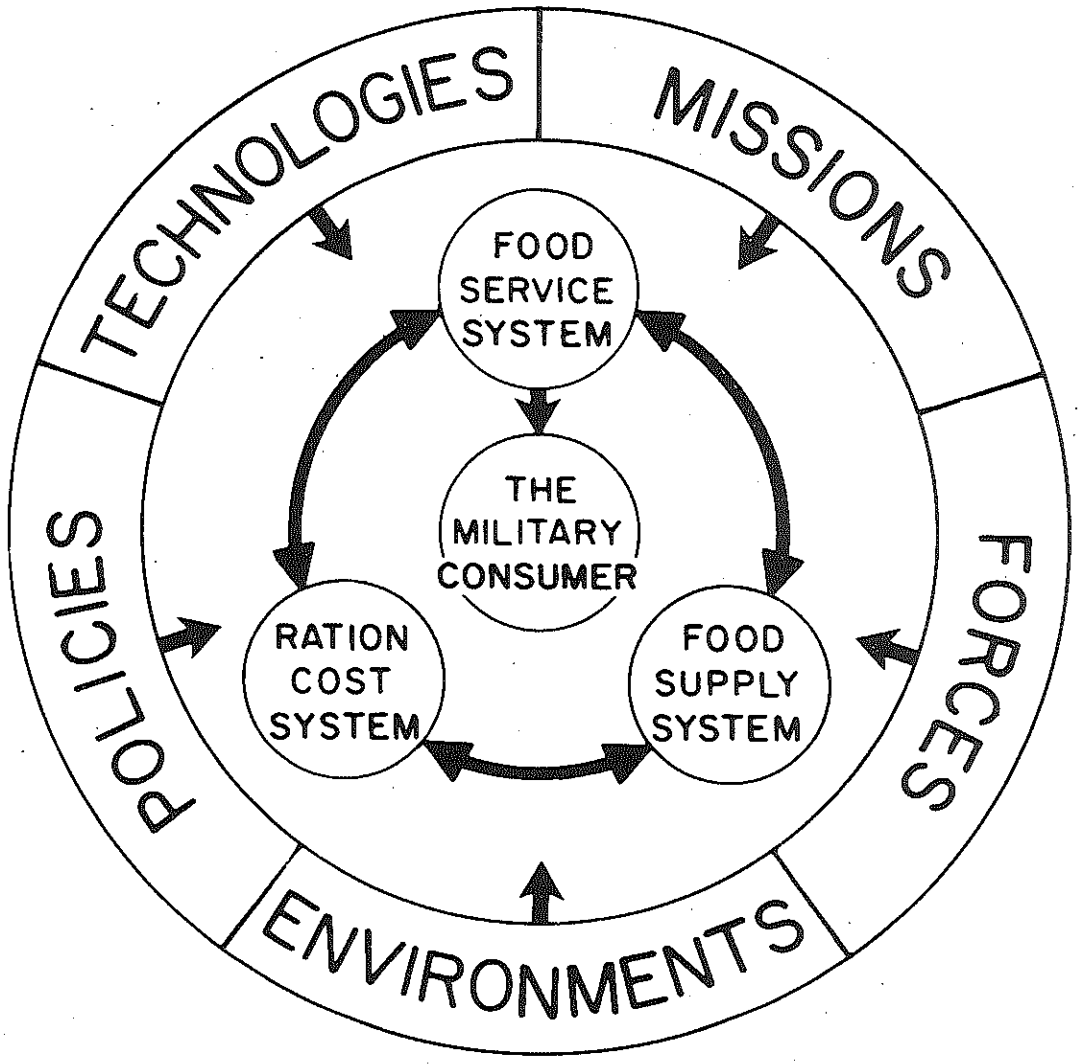


**FIGURE 5. ROLE OF THE RATION COST SYSTEM**

1. **Nutrition:** To provide nutritionally adequate meals so that a member's health and capability to perform assigned tasks are sustained.

2. **Morale:** To enhance a member's morale by providing well prepared meals that reflect current food preferences.

3. **Preparedness:** To maintain food service capabilities in a state of readiness that will permit effective response for mobilization and other emergency conditions.

One of the most noteworthy facets of military subsistence operations is the unusually large number of types of food service systems involved. As Figure 5 suggests, this results from a number of factors:

- the wide variety of military missions.
- the different types of military forces that carry out the various missions.
- the numerous environmental variables, including geographical location, climate, combat vs non-combat, and garrison, field, afloat or airborne situations.
- the various management policy decisions such as the types of system operator options (government, contractor, other) to be used and whether subsistence-in-kind feeding, cash sales (all BAS), or a combination of the two will be pursued.
- the technological and engineering developments in food preparation, preservation, packaging and equipment to meet the spectrum of military requirements.

Food service systems exist as a support activity to the mission-oriented operations of military forces. In a similar vein, ration cost systems should be viewed as providing a support function for food service systems. Therefore, ration cost systems must be designed to be compatible with food service systems. This means they must be consistent with mission requirements and with the nutrition, morale and preparedness objectives; and they must be adaptable to all the types of food service systems.

## FOOD SUPPLY SYSTEMS

Military logistics systems have their own characteristics and also take a variety of forms. The logistics system of particular interest in this discussion is the food supply system. The functional relationship between food supply systems and food service systems is self-evident; it need only be commented that the two systems must be compatible with each other. For example, the food service system must be capable of preparing food

in the form delivered by the supply system. From the standpoint of the URCS program, the key consideration is that the ration cost system must be adaptable to the supply system just as it is to the food service system.

Features of supply systems that impact on the selection of ration cost systems include:

- the food distribution policy; that is, the kinds of food products that are delivered under various circumstances (e.g., garrison, field, afloat; CONUS, OCONUS) by:
  - the central supply distribution system
  - local purchase
  - "on-station" processing (e.g., bakeries)
- the pricing policy
  - constant vs variable prices on food items at the various user geographical locations (in either case, prices will of course vary as a function of time)
  - the need to consider local purchase item prices in determining the monetary value of the BDFA
- the accounting policy
  - monetary control methods
  - food control methods
  - a combination of the two

These factors have been found to have a discernible effect on the form of ration administration in some 15 institutions that have been studied (see reference 3) in this program. The specific attributes of U.S. military food supply that have the greatest effect in this regard are its extensive supply of a large number of food items to virtually all locations on an equal price per item basis, the provision for local purchase of certain perishable items, the limited use of items produced on-station, and the emphasis on monetary accounting. These characteristics are by no means representative of food supply systems in many foreign armed forces, and if the characteristics were to change to any

significant degree, the requirements for the ration cost system would also change. Parenthetically it is noted that the system must also be capable of application in other food supply environments such as in combat feeding when food issue may be on the basis of the per ration allocation of available food products, rather than on strictly monetary accounting principles.

## RATION COST SYSTEMS

A ration cost system provides and controls the financial resources for the procurement of food, or for granting monetary allowances in lieu of food, in military food service. Ration cost systems in certain institutions function by controlling food resources directly, and thus financial resources indirectly (Section IV). The ration cost system is distinctive from food service and food supply systems. However, as indicated by the double-headed arrows in Figure 5 and in the preceding discussion, there is a clear and necessary dependency between these systems. Therefore, the ration cost system must not only be able to operate together with all forms of these systems but also must be supportive of their objectives. Another factor requiring consideration (Section II) is that while ration cost systems only address the food element currently, this may change. Recommendations of numerous previous studies —— see preceding references —— have stressed the benefits to be derived from cost control at the system level as opposed to the fragmented control at the element (subsystem) level. Such an approach would permit the system manager to move funds between subsystems (e.g., between food and labor) in order to improve total system performance and/or reduce the total cost of providing food service consistent with providing a ration of acceptable quality. This is typical of the freedom afforded the food service manager of a commercial enterprise. It in no way downgrades the importance of managing food funds prudently. The adoption of such an approach has intuitive and logical appeal from the standpoint of comprehensive food service management, and the URCS should authorize the Defense Department to implement system cost control on a selective and controlled basis.

## DESIRABLE FEATURES OF A URCS

The desired characteristics for a URCS are indicated below based on the observations of Section II and on the preceding discussion. These system design characteristics are:

1. **Uniform Feeding Standard.** The URCS should establish a uniform and statutory standard for military feeding (ration entitlement) that a) supports a level of feeding consistent with that experienced in comparable US civilian organizations, b) insures continuation of that level of feeding under variations in food prices, budgets and other factors, and c) delegates to the Secretary of Defense and the services maximum flexibility in determining the types and quantities of foods to be provided to meet changing consumer requirements.

2. **Nutrition.** The URCS should be designed on the basis of providing a ration that satisfies prescribed nutritional requirements.

3. **Preference.** The URCS should be based on providing a ration that responds to consumer food preferences and thus serves to sustain morale. Similar morale considerations also apply to the granting of monetary allowances to authorized personnel and to the form of the ration cost system itself, as perceived by the consumer.

4. **Preparedness.** By achievement of reasonably high attendance (headcounts) through customer satisfaction and by controlling the extent of civilian food service employment, the form of the URCS should foster the maintaining of an adequate food service capability (especially trained military cooks) for mobilization and other emergency situations.

5. **Compatibility.** The URCS should be designed to be compatible with the existing and planned food service systems of all services under all operating conditions. It should also be consistent with the food distribution, pricing and accounting policies of military supply systems.

6. **Feeding Guide.** As a desirable feature, the URCS should provide not only an appropriate monetary level for the ration but also a guideline relative to representative types and quantities of foods for military menus.

7. **Local Choice.** The URCS should be compatible with local freedom in menu preparation and in the foods that are served. The system must also function in cases when operating conditions render this option infeasible or undesirable.

8. **Ease of Change.** The URCS design should facilitate revisions in the system to accomodate changing food and equipment technology, food preferences, military requirements, and new systems of food service.

9. **Fairness.** The levels of subsistence-in-kind or monetary allowances that are provided by the URCS should be fair and consistent among all classes of military personnel in all services. There should be a direct and equitable relationship between the BDFA value and the BAS.

10. **Simplicity.** The URCS should provide inherently simple operating and economic controls in order to facilitate routine use at the unit level and to minimize the required use of resources for administration and financial accounting.

11. **Effectiveness Incentives.** To the extent practicable the URCS should create positive incentives for food service management at the operating level to maintain high performance, such as quality food service, high consumer acceptance and effective control of costs.

12. **Applicability to Non-Food Elements.** The URCS should enable control of resources at the food service system level, permitting trade-offs of funds between system elements, in those cases where system benefits can be achieved without increasing system costs.

13. **Scheduled Review.** It should be required that the URCS be reviewed on a periodic basis in order to provide timely modifications.

These criteria are applied selectively in succeeding sections in evaluating candidate ration cost systems and in establishing the structure of the recommended system.

## SECTION IV

## ALTERNATIVE TYPES OF RATION COST SYSTEMS

### PURPOSE

The purpose of this section is to define the various types of ration cost systems and to evaluate their suitability and desirability for use within the Department of Defense uniform ration cost system (URCS). This effort represents an expansion of the scope of the study as planned, since it was originally intented to concentrate the effort entirely on analyzing and revising the current system. Even with this expanded investigation, by far the greatest part of the program effort has been directed to the existing system. The intention of this investigation has not been to deliberately change that system but rather to determine if some other system is clearly more attractive and to generate ideas that might otherwise be overlooked.

The previously referenced study of ration cost systems, "An Analysis of Foreign Military and U.S. Institutional Ration Cost Systems," has provided the largest part of the information that is summarized here. The authors have also benefited from discussions with others, including Mr. Robert M. Jailer, Planning Research Corporation, and members of the Operations Research/Systems Analysis Office, U.S. Army Natick Development Center. In conducting this analysis, two types of alternatives have been of interest: first, total ration cost systems which if adopted could involve substantial changes in the present system, and second, elements of ration cost systems which could be incorporated into the present system without changing it in a major way. This section will focus on the various types of total systems and their advantages and disadvantages. Alternatives relevant to changing some more limited aspect of the current system will be introduced in subsequent sections, or separate reports, as appropriate.

### TYPES OF RATION COST SYSTEMS

The major types of ration cost systems are as follows:

Monetary Control

Food Control

Monetary or Food Control

Monetary and Food Control

Optimization Control

Total System Cost Control

All of these systems except the last one are concerned with controlling the cost of food only and do not directly consider other food service system costs.

**Monetary control** systems regulate the cost of food by imposing a cost limit on the purchase of food items. In this type of system the food service manager has the freedom to purchase a wide range of food items subject to the constraint that the allowable cost per person fed or authorized to be fed does not exceed a stated limit. Other constraints, such as nutritional requirements, may also apply. The cost limit is effective for a specified period of time, such as a day, month, quarter, or year.

**Food control** systems exercise control by limiting the types and quantities of foods purchased (or issued) without direct regard for their cost. The manager is entitled to purchase or requisition up to the indicated daily allowance within each designated food grouping for each person entitled to a ration.

In **monetary or food control** systems, provision is made for both forms of control to provide flexibility under a wide range of operating circumstances. Typically, only one approach is used under normal conditions.

**Monetary and food control** systems provide for control of some food items under a cost limitation and others by food quantity limitation.

**Optimization control** systems use mathematical programming methods to solve for either a highest preference or lowest cost menu subject to meeting nutritional and other constraints. This can be considered a form of monetary control system since even in the case of the high preference menu it can be recapitulated into its basic food items and then costed to arrive at a food cost limitation.

Under **total system cost control**, the cost of food as one element of the food service system is controlled within limitations on the cost of the entire system. Since focus is on the total cost of the food service operation, cost tradeoffs between food and other system elements (e.g., labor, equipment, facilities) are permissible. Again, this is a version of a monetary control system.

In discussing monetary control systems, one other distinction may be made: some systems are **variable** cost and others are **fixed** cost. If the cost of feeding is allowed to vary in line with the market price of food, then the funding agency (e.g., the government) faces a variable cost situation in that food costs for the budget period (usually one year) can not be accurately determined in advance. On the other hand, some monetary control systems fix the expenditures for food over an annual budgetary period, and thus the funding agency can determine its expenditure requirements prior to the start of the period. In fixing the allowed expenditure, some fixed cost systems permit use of an estimated food cost inflation factor for the period.

At this point specific types of systems that fall within the above six general types will be examined briefly. This discussion does not cover all types of systems that can be designed, but it does address the ones considered most relevant for the URCS.

## MONETARY CONTROL SYSTEMS

### CURRENT DoD SYSTEM

The existing system has been described in Section II. Even though this system is controlled by a statute that specifies the enlisted ration entitlement by generic types of foods and specified quantities, it has evolved over the years into a monetary control system. The food cost index, which was developed in essential compliance with the statutory requirements, sets a dollar allowance (BDFA) for the daily food for each attendee and ensures a constant level of feeding independent of food price changes. Under this system all DoD and service standard (Master) menus are only guides; therefore, there is considerable local freedom in purchasing food at the "grass roots" level of operation. Overall, the system has other assets, including the fact that it is generally well accepted within the military services.

As pointed out, the current system is a dual monetary control system, providing subsistence-in-kind (SIK) to one group of enlisted members and basic allowance for subsistence (BAS) to the other. The flexibility of this system permits a considerable number of variations of the system to exist, ranging from all SIK on one extreme to all BAS on the other and involving operation by either the government or by non-government organizations. Specific real or potential alternatives to the current system that will be briefly summarized here are as follows:

- Contractor Operation
- All SIK
- All BAS (Government Operation)
- All BAS (Pay Deduction)
- All BAS (Non – Government Operation)

The principal reason for introducing these particular systems is that each illustrates a different form of monetary control at the government level, the local operating level, or both. Rounding out the discussion of monetary control systems will be a summary of a Negotiated Budget approach.

## CONTRACTOR OPERATED CURRENT SYSTEM

One example of the flexibility of the current system is illustrated by contractor operations. The dual SIK/BAS aspect is not changed by this kind of arrangement. Aside from contractor provided mess attendant (KP) services, two contractor operations are of interest: one involves the contractor providing food service labor only, and in the other case the contractor provides both labor and food. Competitive bidding on the latter type of contract is based on serving a specific cyclic menu. The contractor bids on a cost per meal basis and is paid as a function of the actual headcount. From a ration cost viewpoint, it is interesting to note that under this system the cost of food for the military consumer is not controlled by the BDFA value.

A recent study[16] has been made of two selected contractor operated systems (one labor only, the other labor and food) in comparison with a standard government operated system. The system using contractor food and labor was the least expensive overall, and although it was slightly lower in nutrition provided in the average ration, it scored highest in an evaluation by customers. The evidence was that this system served smaller portion sizes and lower cost foods but was preferred by the patrons because it appeared to be better managed and more consumer-oriented. The contractor system providing labor only was more expensive than the above mentioned system but less expensive than the government operated system. In customer acceptance it was judged to be approximately equal to the government system in this study.

Even though based on a limited sample, this analysis suggests that well-run contractor operated systems have merit in comparison with traditional military food service operations. Nonetheless, because there are many operational feeding situations in which contractors would not be used, thus requiring trained military food service personnel, it would not be possible to adopt this type of system as the major ration cost system. Instead it is viewed as one version of the current system to be used in situations in which cost and benefit considerations make it preferred.

## ALL SIK SYSTEM

In this variation of the current system, all enlisted members would receive "meals as a part of pay," and the BAS monetary allowance would be eliminated under normal circumstances. If desired, officers could also be placed under this arrangement. Military

[16] Bustead, R. L. et al, "An Evaluation of Food Service Systems at Ft. Myer, Bolling AFB and Ft. Benjamin Harrison," U.S. Army Natick Laboratories Technical Report 75-36-OR/SA.

ration administration is conducted on this basis in The Netherlands at this time. In DoD this is the type of ration cost system normally applied to enlisted personnel assigned aboard ship and in certain other "captive" feeding situations, such as combat feeding. If this type of system were to be implemented in DoD, it would be necessary to provide BAS for cases when government messing facilities were not available.

One feature of this system is that it would place all consumers on an equal basis in terms of subsistence. It would also introduce some operating simplifications; for example, meal cards would not be required to be used since military ID cards would establish eligibility for rations. Further, cash collections at meals would be eliminated except in the case of guests and, if applicable, officers.

Probably the greatest impacts would be in the areas of attendance, costs, and morale. It is predicable that total attendance would rise as individuals who would otherwise be on BAS would make greater use of "free" meals. Thus, the government's cost of food, food service labor, and related operations would rise. The increased need for food service personnel would result in improved preparedness in the sense of creating an opportunity to utilize a greater number of trained military cooks. However, this would not necessarily be true if a policy of employing more civilian cooks was pursued or if greater use made of non-appropriated fund facilities as part of the system.

Funds budgeted and allocated for BAS would be eliminated. Since over 50 percent of enlisted personnel are normally on BAS, this represents a large sum of money. Under current accounting procedures, the government would actually save subsistence funds when these personnel would absent themselves from meals. In essence, the most significant cost difference between ALL SIK and ALL BAS systems would be the savings attributed to the absentee factor. An exact cost comparison between an ALL SIK system and the current system would require a number of assumptions and has not been attempted in this study. However, it is the opinion of this study item that the ALL SIK system should prove to be less expensive.

The major disadvantages lie in the morale area. Appreciable survey data* indicates that receiving BAS is very popular with personnel and a large number of enlisted personnel have come to view BAS as part of their regular compensation. As a result, the authorizing of BAS is widely accepted as a morale factor by commanders and undoubtedly explains why an increasingly liberal posture on granting BAS status has been generally adopted in recent years. Thus, the shift to an ALL SIK ration cost system would be definitely negative in the eyes of most enlisted personnel and would not fit well at all with the all volunteer force. As a contrast to this system, the ALL BAS ration cost system will be discussed next.

*Collected by Headquarters, USAF, and the Food Sciences Laboratory, U.S.A. Natick Development Center

## ALL BAS SYSTEM

This approach would place all enlisted members on BAS. Meals in appropriated fund dining halls would then be purchased under one of the following arrangements:

- single meal prices. Breakfast, dinner and supper would be offered at a fixed price in the same manner that applies for BAS customers now.

- multiple meal prices. Same as the preceding except two or three price level meals (e.g., low, medium, high cost) would be offered at each meal period.

- item pricing. This "a la carte" approach would operate like a civilian cafeteria with the customer being charged separately for each item taken.

- meal purchase plan. Books of meal tickets for specific periods (e.g., a week) are sold to customers in a similar fashion to plans offered in many colleges. The price of the ticket book might represent a discount from full attendance prices since it could consider an estimate of the absentee rate.

These are the most obvious ways an ALL BAS system would work but by no means exhaust all the possibilities. The first question to be addressed in an ALL BAS system is its legality. In 1974 the DoD General Counsel[17] advised that in the judgment of his office, the Congress "contemplated a generalized system of providing subsistence in kind" for enlisted personnel with BAS offered as an exception. This interpretation could restrict use of an ALL BAS system now, but it would appear that if there are sufficient reasons for adopting an ALL BAS system, new legislation could be passed authorizing its use.

Probably the key issues concerning this type of system are customer morale and costs. An ALL BAS item pricing system test that started at Shaw Air Force Base, South Carolina, in October 1972 has clearly shown that enlisted personnel strongly prefer being on BAS status. Under this system the individual, having been provided funds in his paycheck for subsistence, is tied less to the military dining facilities and is more financially free to purchase meals wherever he wishes. This is in keeping with the life style of the contemporary young enlisted person, and the system is therefore a positive morale factor. However, the ALL BAS system is much more expensive for the government. This can be seen by considering the obvious fact that in a normal system there are two types of customers, SIK and BAS, and they will either be present or absent at meals. The food cost for the government in the dual system equals:

[17] Memorandum for Lt. Col. Jerry L. Welbourn, OASD (I&L), from Nissel, S.N., Office of the Assistant, Office of the General Counsel, Department of Defense, Subj: "DoD Obligation to Feed Enlisted Personnel," March 19, 1974.

$BDFA (SIK rations fed) + $0 (SIK rations absent) + $BAS (BAS rations fed) + $BAS (BAS rations absent), where $BDFA and $BAS are the daily monetary rates for personnel in the SIK and BAS categories.

In other words, the government purchases food for SIK personnel attending an appropriated fund dining facility at a daily cost of the monetary value of the BDFA. On the other hand, there is no food cost to the government for SIK who absent themselves from meals. In the case of BAS patrons, the net cost to the government is the value of the BAS rate whether they attend a military dining facility or not. This is true because when they attend, they are charged an amount in cash which is approximately equal to the cost of the food to the government --that is, the government "breaks even." Therefore, in an ALL BAS system the government's equivalent cost for food is equal to BAS rate times the total number of enlisted personnel. Under the assumption that the BDFA and BAS rates are effectively equal, the increased cost of the all BAS system is therefore equal to money that is saved (i.e., not spent) on SIK absentees in the dual system. This can be an appreciable amount. In a recent speech[18] Mr. Arthur Mendolia, Assistant Secretary of Defense for Installations and Logistics, pointed out that on the average, 15% of enlisted personnel who are authorized to eat in dining halls free are absent from meals thus constituting about 300,000 missed rations per day for all of DoD. Based on a representative value of $2.50 for the BDFA rate, the absences are saving the government about $275 million each year which it would pay out in the event an ALL BAS system were now in existence. Serving to confirm a figure of this magnitude, an Air Force[19] report recently stated that the increased cost of ALL BAS for that service (without changing other aspects of the system) would be about $53 million annually. There are some characteristics of an ALL BAS system (see below) that should result in some savings against the increased cost, but the extent of such potential savings is not known at this time. Looking back at the cost equation, it is also apparent that the extra costs of the ALL BAS approach would be decreased if the BAS rate were set at a level appreciably below the BDFA rate. While this would reduce the cost to the government, it must be noted that this reduction would be directly at the expense of the enlisted member, and it is doubtful if it would be acceptable to the Congress.

[18] Mendolia, A.I., "Streamlining Military Food Systems," address to R&D Associates, 16 October 1974.

[19] "An Analysis of Air Force Food Service," July 1974.

There are insufficient operating data to permit a quantitative evaluation of the four types of ALL BAS systems introduced above. However, they would all score well on the basis of consumer morale since they provide the BAS allowance to all enlisted personnel. The single meal, multiple meal and item pricing approaches merely reflect pricing policies. Of the three, item pricing would be preferable for most situations since it is a more flexible pricing approach and especially because the customer pays for exactly what he takes, thus representing a pricing approach that is fair to all concerned. Data from an Air Force survey at Shaw AFB indicate that item pricing has been well received there. There is no military operating experience to indicate the utility of a meal purchase plan approach. Since different plans can be offered (e.g., 10, 15, or 21 meals per week), the consumer can select the attendance rate that fits his eating pattern. The handling of cash in the dining hall is of course considerably reduced. This plan works satisfactorily at colleges and universities because by purchasing tickets in advance of a semester students are assured of food even though they may become pressed for funds during that period. In view of the frequent periodic pay of armed forces enlisted personnel and the assurance that rations will always be made available, this approach does not appear to offer special advantages for DoD personnel.

The BAS/a la carte test program at Shaw AFB, provides information on the advantages and disadvantages of that system. No attempt is made here to provide full coverage of the information contained in the test reports[20,21] but the observations about this system as compared with an SIK/BAS system are summarized as follows:

**Advantages:**

- placing all personnel on BAS is enthusiastically preferred.
- item pricing has been favorably received and the average meal check is less than what a BAS customer would pay in a standard dining hall.
- there is less plate waste; individuals seem more inclined to eat what they take.
- monetary controls over food costs are more efficient.

[20] "Interim Test & Evaluation Report, Military Feeding Study, Shaw AFB SC", 20 February 1972.

[21] Siebold, J.R. and Meiselman, H.L., "Consumer Evaluation of Cash Food Systems: Shaw AFB", U.S. Army Natick Development Center, Technical Report TR-75-77-FSL.

- the system is fairer to personnel as a whole because the SIK individual no longer gives up the value of the meal when he is absent, and the consumer pays as a function of what he takes.

- the irritations associated with the headcount and the problems of administering meal cards are eliminated.

**Disadvantages:**

- the overall cost to the government is noticably higher.

- the cost of food service labor is higher.

- the required skill level of food service personnel is higher to ensure a satisfactory operation.

- based on food purchase data, the average patron takes more lower quality foods (e.g., the ration of ground and diced meats to sliced meats is much higher) and smaller total quantities of food per meal. This appears to result from the individual economizing when he pays for meals out of his own pocket.

- average nutrition per meal is lower except for fat content, which is higher. However, this must be considered in the context of only about 10% of eligible meals actually being taken in the dining facility.

- the system is not applicable to all armed forces feeding situations. Other services have viewed it as not suitable for field feeding, shipboard use, and recruit training feeding, for example.

In summary, the major advantages seem to be the morale and improved quality of living of the enlisted member and the fairness of the system. Offsetting disadvantages are the cost, demands on food service labor, and unsuitability for all feeding situations. It is recognized that the above is a very simplistic analysis, and the reader is encouraged to review the cited references for more information. Many of the perceived advantages and disadvantages require further quantification and understanding, and to that end additional testing of the concept is now going forward at another Air Force Base (Loring AFB) and is planned to take place later at Navy, Marine Corps and Army installations.

The above indication that an ALL BAS/a la carte system does not appear feasible in certain military operational situations suggests that "ALL BAS" is in fact a misnomer. It is undoubtedly true, therefore, that a subsistence-in-kind system must be retained for a number of applications even if BAS/a la carte, or some similar system, were to be widely adopted.

In view of the extensive test programs in progress and planned, it would be premature for this study to provide an overall judgment on an ALL BAS/a la carte system at this time. What can be said is that the system is quite attractive when considered in the light of URCS program objectives to develop "a ration cost system which will be directly related to known consumer requirements". This of course follows from the indicated preference of the enlisted member for this type of system. What remains to be more accurately determined and evaluated are the resource demands, specifically the increased costs, imposed by the system and the operating environments in which it is effective.

### ALL BAS SYSTEM (With Pay Deductions)

Another form of BAS system would involve placing all enlisted personnel on BAS status but then deduct the cost of food from the pay of those who would normally be on SIK. In particular, this deduction would pertain to the young, single enlisted person who would normally live on base in "single quarters" (i.e., dormitory, barracks or aboard ship). The idea would be to seek to tie (economically) a larger part of this population to the dining hall in the interests of their nutrition and health. This would also attempt to serve the important purpose of providing an increased dining population so as to maintain a larger number of trained food service personnel for mobilization and emergencies. Under this system, persons not subject to deduction from pay would pay cash for meals attended in the dining facility.

There are a number of ways the amount of the pay to be deducted for food could be determined; for example, a food cost index (BDFA) could be applied to determine the dollar level. In all likelihood a standard approach for determining the deduction would apply throughout the services. In connection with this type of system, the concept of a "remission rate" is utilized in Canada. The Canadian standard monthly deduction is based on representative food costs and is normally changed annually. However, in fairness to the mess member the fact that he or she would normally be absent from the mess for many days during the year because of holidays, leave, absences of 48 hours or more (e.g., weekends), and other justifiable reasons is taken into account. Therefore, the individual is not charged for these days; that is, the monthly pay deduction is reduced by an amount consistent with 1/12 of the recognized annual absentee days independent of when during the year the absences actually occur.

A particular reason for discussing this ration cost system is that it is characteristic of the "single pay" system of military compensation in use in Canada, the United Kingdom and Australia. This type of compensation system has been reported as being under consideration for future use in the U.S. armed forces. The system provides "equal pay for equal work", and hence there is no distinction in pay between married and single members serving at the same military seniority level. Under this approach, quarters and subsistence allowances are eliminated (total basic pay is set commensurate with civilian pay scales), and a service member pays by monthly payroll deduction for quarters and rations when provided by the government. There do not appear to be significant reasons for recommending adoption of an ALL BAS system with payroll deductions now, but a system of this sort would be a candidate for use if the US were to adopt the single pay approach.

## ALL BAS SYSTEM (Non-Government Operation)

In the preceding discussion, contractor operation of appropriated fund dining facilities under the dual SIK/BAS system has been covered. Operation of ALL BAS facilities under the same general arrangement would also be possible, although different criteria for awarding the contract and for determining payment to the contractor may be necessary.

Another type of system for the ALL BAS approach would be one in which a non-government organization operates the dining facility and its income derives directly from sales to the customer rather than from a contractual arrangement with the government. For example, the government dining facility could be operated by the Exchange System, the local Enlisted Club organization, or by a private enterprise company. The operator could provide both food and labor and charge accordingly. Or, the food could be provided by the government on a reimbursable basis, with the contractor adding his costs and margin to the food cost.

In analyzing this system the types of BAS allowances should be considered. The types of situations under which enlisted members may become entitled to BAS (on a daily basis) are now as follows:

1. When rations in kind are not available,
2. When permission to mess separately is granted, or
3. When assigned to duty under emergency conditions when no messing facilities of the US are available.

The most common BAS allowance is for the situation "when permission to mess separately is granted". When BAS is mentioned, this is the rate that is normally meant. This is the lowest monetary rate provided (currently $2.41). Previously the rate was changed annually to bring it into approximate agreement with the current value of the BDFA —— that is, equal to "the cost of the ration" (Title 37, U.S. Code, Section 402). In 1974 the procedure was changed and now the BAS is changed annually the same percentage as the increase applied to basic pay. In any case the BAS is generally regarded as equivalent to the cost of food, and when the BAS customer dines in an appropriate fund dining facility, he in effect pays for the food and the government pays for all other food service system costs (e.g., labor). The ration cost system alternative under discussion would therefore present a problem in terms of this BAS rate since if costs are collected solely from the customer, the enlisted member would of necessity be paying both for food and for other costs of the operation, including the operator's profit margin. Under these conditions fairness to the enlisted member would require payment of a BAS allowance commensurate with the total cost of dining in the system. This problem is further aggravated by the fact that neither the allowance for "when rations in kind are not available" nor the allowance for "when assigned to duty under emergency conditions when no messing facilities of the US are available" are viewed by this study as being adequate for a reasonable ration under such "total cost" conditions.

The first allowance[22] is $2.71 and the second is $3.61, both on a per day basis. On a comparative basis, the total cost of a meal in a recent food service system test at a US installation* was shown to be $2.41, or an equivalent $7.23 per person per day. This is not to say that the BAS rate should be based solely on this data, but it does highlight the need for an increased BAS allowance for this type of system alternative. Whether providing such an allowance would result in overall increased costs to the government would depend on a number of factors which would need to be quantified. Another important consideration is the fact the services' need for trained food service manpower for various special conditions (e.g., combat feeding) would preclude full adoption of this type of system.

[22] Department of Defense, "Military Pay and Allowances Entitlements Manual".

*Data collected at Travis AFB, Nov. 1973 – Jan. 1974.

## NEGOTIATED BUDGET SYSTEM

In this type of system the cost of the ration is established by negotiation between the food service manager and the installation commander, or his financial manager. This approach is used because the cost of food is "managed" within the installation budget, rather than being fixed by formula (e.g., a FCI). The factors normally used in arriving at the food budget include the following:

- food cost experience in the preceding period(s)
- budget guidance under which the head of the installation is operating (i.e., expanding or contracting overall budget)
- projection of the workload (number of people to be fed)
- projection of food costs during the period

Various controls are applied to ensure that foods of adequate quality and quantity are provided. First, the institutional food budget is reviewed for reasonableness by higher authority. Second, this type of system generally requires that specified weights of particular food types be provided on the average for each customer daily in order to ensure nutritional adequacy. An example of such requirements currently in use by the Federal Prison System is shown in Table 2. In addition, one organization using this type of system (the Veterans Administration) computes the cost for a standard ration using prices experienced at each installation and compares it with actual ration costs at that location. If the ration provided at an installation is considered deficient (i.e., too high or low) with respect to any of these controls, the pertinent officials are directed to take corrective measures.

Because the total funds allocated for the purchase of food under this system are fixed for a period of time, typically a quarter of a year, it is important that the number of people to be fed be predictable on a fairly accurate basis. It is also helpful if an inflation factor can be introduced to enable allowance for price increases in annual budgeting. In this respect it is noted that headcounts often fluctuate appreciably in armed forces dining facilities and that inflation factors are not permitted in DoD budgeting. Perhaps the greatest impact of this type of system on past ways of doing business if it were introduced within DoD is that it would require "guns or butter" decisions by the local commander. It is not possible to determine the effects of such decisions, but it is the opinion of the URCS study team that little if any gain for the individual enlisted member would result. Although a negotiated food budget system could be used in certain military environments (e.g., hospitals), the system does not appear to have any particular merit from the standpoint of food service for widespread use within DoD. In a broader sense, any management approach that places all spending decisions on the local commander within a total installation budget would have ramifications that would extend well beyond food service administration.

## TABLE 2

### THE STANDARD RATION--FEDERAL BUREAU OF PRISONS
(in Pounds per Ration)

| | Food Detail | Adult Male | Youth | Hospital | Female |
|---|---|---|---|---|---|
| 01a | Beef | .28 to .32 | .28 to .32 | .28 to .32 | .28 to .32 |
| 01b | Pork | .16 to .18 | .16 to .18 | .16 to .18 | .16 to .18 |
| 01c | Other Meats | .16 to .17 | .16 to .17 | .16 to .17 | .16 to .17 |
| 02 | Fats | .18 | .18 | .18 | .18 |
| 03 | Starches | .80 | .80 | .80 | .50 |
| 04a | Milk | .84 to 1.72 | .84 to 1.72 | .84 to 1.72 | .84 to 1.72 |
| 04b | Cheese | .06 | .06 | .06 | .06 |
| 05 | Eggs | .12 | .12 | .15 | .12 |
| 06 | Sweets | .30 | .35 | .30 | .30 |
| 07 | Beverages | .07 | .07 | .07 | .07 |
| 08 | Potatoes | .75 | .75 | .75 | .55 |
| 09 | Other Roots | .25 | .25 | .20 | .20 |
| 10 | LGY Vegetables | .55 | .55 | .55 | .70 |
| 11 | Tomatoes | .20 | .20 | .20 | .20 |
| 12 | Dried BPN | .10 | .10 | .10 | .10 |
| 13 | F & C Fruits | .25 | .30 | .25 | .25 |
| 14 | Citrus Fruits | .10 | .10 | .20 | .10 |
| 15 | Dried Fruits | .05 | .05 | .05 | .05 |
| 16 | Adjuncts | .10 | .10 | .10 | .10 |
| | | 5.32 to 6.72 | 5.42 to 6.36 | 5.40 to 6.35 | 4.87 to 5.87 |

## FOOD CONTROL SYSTEMS

It will be recalled that in this type of system the control is a food allowance rather than a cost allowance.

### FOOD PLAN (Commodity Group Control)

The basic element of this type of system is the ration scale, or food allowance list, which provides a list of commodities constituting the ration entitlement. This list is used to control the issue of food; it is not used as the FCI is to arrive at a daily cash allowance (BDFA). The ration scale is divided into basic commodity groups, and within most of these groups there are a number of alternative foods from which selections can be made in local planning of the daily menu. As an example, the Meat-Poultry-Fish Group from the Canadian Armed Forces Standard Ration Scale is shown in Table 3. The control used is to determine the number of rations drawn within each group on the basis of the actual types and quantities of foods issued. For example:

**Meat-Poultry-Fish Group**

| Item | Quantity Issued | Quantity Per Ration (Oz) | Rations Issued |
|---|---|---|---|
| Beef, carcass | 60 lbs. | 12 | 80 |
| Sausage | 32 lbs. | 8 | 64 |
| Fish, fresh | 75 lbs. | 12 | 100 |
| | | Total rations issued in this group: | 244 |

The 244 rations would be compared with the number of rations to which the unit is entitled for the same time period to determine if the unit is overdrawn or underdrawn within this commodity group. Similar computations are made in each of the other groups (e.g., cheese, juices and citrus fruit). Overdrawals are to be avoided at the end of a ration accounting period, but it is not required that a unit utilize all of its food allowance within each group. A small daily cash allowance per person may be provided to cover condiments and other minor items that are not listed in the ration scale.

One organization known to be currently using this type of system determines the number of ration entitlements based on the number of personnel "living in", or on roster count. A signature headcount at meals is not used. Generally this system functions

## TABLE 3

### STANDARD RATION SCALE (RSI)—— CANADIAN ARMED FORCES

**MEAT-POULTRY-FISH GROUP:**

| Item | Maximum Daily Ration (ounces) |
|---|---|
| Beef, carcass, fresh or frozen | 12 |
| or Beef corned, bulk, chilled or frozen | 9 |
| or Cottage Roll, smoked or pickled | 9 |
| or Ham, smoked, bone-in | 9 |
| or Heart, fresh or frozen (beef) | 12 |
| or Kidney, fresh or frozen (beef, lamb) | 12 |
| or Liver, fresh or frozen (beef, pork) | 12 |
| or Lamb, carcass, fresh or frozen | 12 |
| or Pork Cuts, fresh or frozen (ham, trimmed loin or shoulder) | 9 |
| or Pork Cuts, Fresh or frozen (loin or side ribs) | 14 |
| or Preserved Meat (bologna, canned corned beef, canned luncheon meat, liverwurst, salami) | 12 |
| or Sausage, fresh or frozen (pork) | 8 |
| or Tongue, fresh, frozen or pickled (beef, lamb, pork, veal) | 12 |
| or Veal, carcass, fresh or frozen | 12 |
| or Wieners, fresh | 8 |
| or Poultry, fresh or frozen (chicken, turkey) | 12 |
| or Fish, canned (chicken haddie, salmon, sardines, tuna flaked) | 12 |
| or Fish (cod dried and salted, cod salted, herring salted or pickled) | 12 |
| or Fish, smoked, fileted, (cod, haddock, kippered herring) | 12 |
| or Fish, whole dressed or fileted, fresh or frozen (cod, flounder, haddock, halibut, lake trout, pickerel, salmon, sole, swordfish, whitefish) | 12 |
| or Scallops, fresh or frozen | 12 |

under the "single pay" approach to compensation, and it also incorporates other features of that type of compensation, namely pay deduction for food costs and a remission rate for a certain number of missed meals. It may also include free meals for married personnel separated from their families. It should be noted that this system could operate under an approach other than the single pay approach.

This type of food control system is designated to provide a constant level of feeding independent of food price changes. The control by food groups is intended to provide nutritional balance, and the food issue constraints also result in a measure of cost control. However, the costs per ration vary somewhat between installations, due primarily to the unequal costs of the choices within each food group. Because the total annual costs cannot be accurately determined in advance, this is a variable cost system.

This food cost control system has particular merit for organizations with installations which face different food costs because the supply system does not provide food items at the same prices throughout the geographical locations involved. In such cases the system provides an equivalent ration at all locations in spite of the food price structure problem. The nutritional control provided by the system prevents a dining facility from purchasing an inordinate amount of some item at the expense of balanced amounts of other types of foods. However, actual food intake is an individual choice, and neither this nor any other voluntary feeding system can assure that the consumer will eat a nutritionally sound meal. Although simple in concept, the system does have some complexities. For example, the ration scale has to be quite detailed and comprehensive so that basically all foods issued can be converted into ration equivalents. The difficulty of doing this results in a small cash allowance being provided to cover "extras." Further, one ration scale may not be adequate because of the many types of feeding systems; for example, the Canadian forces have 13 scales. In addition, these systems appear to require a wider variety of supplementary provisions than used in the DoD system in order to cover situations such as field exercises, arduous duty, unusual weather, certain religions, Christmas, night duty, diving, certain types of training, aircrews, young apprentices, women, and so forth. In those limited number of cases for which the DoD makes special provisions, it does so by adding a small percentage to the monetary value of the BDFA.

There is no apparent reason a commodity group Food Plan system would not prove fundamentally satisfactory as the basis for a URCS in DoD. In view of its successful use in single pay system, it would be a candidate approach were DoD to adopt such a system. However, the effectiveness of the US military supply system in providing food at the same prices throughout the world greatly reduces the need for this type of system because point-to-point equality is achieved by monetary rather than food control. Further, the monetary control type of ration cost system is inherently simpler and provides greater flexibility. Therefore, there appear to be no reasons to give serious consideration to shift from a monetary to food control system at this time.

## FOOD PLAN (Issue Point Control)

In the preceding system, the local dining hall has its choice of menu and hence of food purchased so long as it remains within the commodity group constraints. The food control system of interest here is one that has the following features:

1. the meals served are based on a master or installation menu that applies for all dining halls at that base location and that conforms to the current BDFA.

2. each dining unit provides to the base commissary an estimate of the number of rations (or meals) it will serve.

3. based on determination of the foods required to prepare the installation menu for the estimated number of customers, the commissary control point issues the required food to each dining hall.

4. food rations issued are compared with the number of rations (customers) actually served to provide for control and accounting.

This is basically the field ration system used previously by the Army and Air Force. The system is still applicable for certain feeding environments, such as a subsistence-in-kind system for field feeding. However, operating experience has shown that the flexibility of local (unit) choice in menu design, and placing management initiative at the dining facility level is much preferred for fixed (i.e., garrison) feeding and shipboard feeding situations. Under such local menu planning, it would be unnecessarily complex for each dining hall to provide its particular menu to the food issue point and require the supply organization to determine and provide the requisite raw foods. Therefore, except for food control in field operations, this type of ration cost system is not as compatible with current day feeding concepts as a monetary control system. In fact, this system appears less desirable than the preceding food plan system for routine fixed installation food service.

## ANNUAL FOOD PLAN (Fixed Cost)

The annual food plan is a compilation of food commodities planned for a fiscal year and stated in terms of an individual customer. The plan provides the number and name of each commodity, diets in which it can be used (if applicable), the meal (breakfast, lunch, dinner) in which it is to be served, the prescribed weight per person served, the total times to be served during the year, and the number of times to be served in each period (approximately one month). The plan is issued centrally, but installations are allowed to modify it to suit local preferences and requirements so long as nutritional and cost constraints are observed. Menus are constructed locally consistent with the food plan.

Overall, the food plan serves as:

1. the basis for estimating yearly food requirements.

2. a cost accounting system to develop budget requirements.

3. a nutritional accounting system.

The food plan is part of a total food delivery system, and it forms the basis for food procurement and subsequent food shipments. This ration cost system provides for automated and centralized control, and it relieves the local institution of many manual calculations associated with dietary planning, budgeting, accounting and procurement.

The total annual food budget based on the plan considers the estimated dining population, the current price of food, and an inflation factor for food cost projections. During the year a computer analysis tracks actual food costs at each location, providing comparisons with the forecasted average costs.

This sophisticated system is currently being used successfully in a New York State hospital system serving about 70,000 people daily. This organization evaluated the food plan system in comparison with a statewide standard menu system and found it to be more economical, flexible and reflective of local food preferences.

The installations served by this system are in fixed locations and have relatively stable populations. In this situation the centralization of functions offered by this type of system makes sense. However, it would be difficult if not impossible for the system to effectively support mobile units or, for that matter, dining facilities characterized by widely fluctuating headcounts. Perhaps some of the automated procedures for ordering, shipping, and

accounting, merit consideration for certain DoD CONUS and fixed overseas installations. However, placing the control and accounting functions locally rather than at central headquarters provides appreciable flexibility that is needed by many units. Complete freedom in local menu planning (rather than menu planning constrained by a food plan) is also preferable for DoD in most situations. Finally, the vagaries of food supply sometimes encountered in the military would present formidable problems for such a structured food plan system. Therefore, in spite of the fact that this food plan system has certain noteworthy features, it would not be the best system for DoD use.

## MONETARY OR FOOD CONTROL SYSTEM

This ration cost system provides the option of monetary or food control. For example, in the armed forces of the United Kingdom a unit is able to draw rations in cash, in kind, or a combination of the two. It is understood that in the future the U.K. system is to be based primarily on cash, although the option for rations in kind will be preserved.

If a food control approach is in use, the food plan with commodity group control (described previously) is the most likely form and is, in fact, the method used in the U.K. On the other hand, if a monetary control system is being used by a unit, the allowable cost of the ration is determined by costing the ration scale periodically, very similar to the US BDFA control. In the U.K. this costing is done centrally rather than locally. Ration accounting requires monthly comparison of credits (ration entitlements, supplementary entitlements, and cash collections) with food cost debits. Ration entitlement may be based on a roster count rather than signature headcount, and in the British system single members living in (barracks, ships) pay a fixed food charge which is automatically deducted from their pay.

This ration cost system offers considerable flexibility to the local unit. However, as pointed out earlier, the food control type of system offers no inherent advantages over a monetary control method if the military supply system is able to provide a good selection of food at equal prices to all units. When US forces are in situations in which the food supply is somewhat limited (as in field feeding during combat or maneuvers), the issue of available food to units on the basis of rations being fed works satisfactorily. Thus, in a sense the US also has both monetary and food control options, but in the vast majority of cases the monetary control system is the sole and most preferred approach.

## MONETARY AND FOOD CONTROL SYSTEM

This ration cost system employs both types of control by all units. Generally the rationale for this system is that certain types of foods, non-perishable for the most part, are to be drawn from government supply sources under a food plan. On the other hand,

a monetary allowance, set quarterly by central headquarters, is provided for local purchase of other foods, mostly perishable items. Thus the combination system is compatible with, and probably derives from, the food supply system.

The system is used by the armed forces of The Netherlands. A complete ration scale by types and quantities of foods is provided, but a monetary allowance is allowed to be spent per person per day for items in the ration scale (or designated substitutes having equivalent prices) in the following categories: bread, meat, eggs, cheese, fruit and milk.

The DoD system incorporates this approach in a small way in that 3 items (bread, milk, and corn flakes) in the present FCI require use of local prices in determining the BDFA. Thus, the BDFA varies slightly from one location to another. However, the nature of the DoD supply system is such that adoption of this combination ration cost system is not required.

## OPTIMIZATION CONTROL SYSTEM

Optimization control systems based on use of computer-assisted menu planning (CAMP) are now in use in a number of locations. A system of this type that was examined (Central State Hospital in Georgia) solves for the menu to be served and, as in the case of the Annual Food Plan system, automates food supply and accounting functions.

The approach to determining food types and quantities to be produced and served is based on a computer solution of an optimized 90-day menu plan subject to meeting some 26 different constraints. These include nutritional considerations, minimum number of days separation between servings of a particular menu item, number of meals a day, number of courses a meal, and various meal planning constraints such as taste, texture and temperature compatibility. The resultant 90-day menu (general diet) is the minimum cost solution that satisfies all of these requirements. The dietician may override the program to enter food items into the menu plan for special purposes, if desired. In addition to planning the menu and computing its cost, the computer determines the quantity of ingredients necessary to yield the desired number of servings, and it computes the quantities, kinds and costs of food items necessary for the menu period, thereby permitting adequate procurement lead time.

Like certain preceding systems, this approach is best suited for fixed installations serving relatively constant numbers of people. Because of the diverse feeding situations and variable customer loads, it would not be feasible to apply the system fully in DoD at this time. Looking to the future, however, there are several uses for optimization systems, and there are technical improvements possible in the optimization techniques and data currently employed.

In terms of ration cost systems, an important use of menu optimization is as a method for deriving the food cost index. The underlying premise is that the best basis for the FCI is a representative cyclic menu which is optimized with respect to nutrition, preference (acceptability), and cost. Following construction of the menu, it is recapitulated into its basic food requirements based on an analysis of the recipes. At that point a FCI can be designed either by converting the recap into a lesser number (say 50) of food components that are equivalent in cost to the total list or by costing the entire recap list. Since that total list may be composed of some 300 items, the total cost approach is not likely to be suitable unless a computer is used.

The representative cyclic menu, herein called a reference menu, may be designed under two concepts:

1. preference maximization subject to selected cost and nutrition levels, or

2. cost minimization subject to selected preference and nutrition levels.

In the first method, illustrated in Figure 6, a desired cost level is provided and nutritional constraints must be satisfied. Unless otherwise stated, nutritional constraints shall be considered to be The Surgeons General's "Nutrition Standards." Based on meeting these two constaints, the reference menu is then designed with its overall preference value maximized. For this purpose, data on the food preferences (see reference 10) of armed forces personnel is applied.

The second method is similar except that in this case the constraints are nutrition and a desired preference level for the menu. Preference would be stated in terms of the hedonic scale (see reference) rather than the CAMP approach described above. Subject to satisfying these requirements, a least cost reference menu is constructed. This method is shown diagramatically in Figure 7.

In both cases the data inputs are food prices, nutrition data and menu item preference data. While the latter two change rather infrequently, food prices are often quite dynamic. Because of this it can be expected that the reference menu solution will change as often as prices change measurably. As a result the FCI can change under these methods in sympathy with food prices and, if pertinent, with changes in nutrition and preference values.

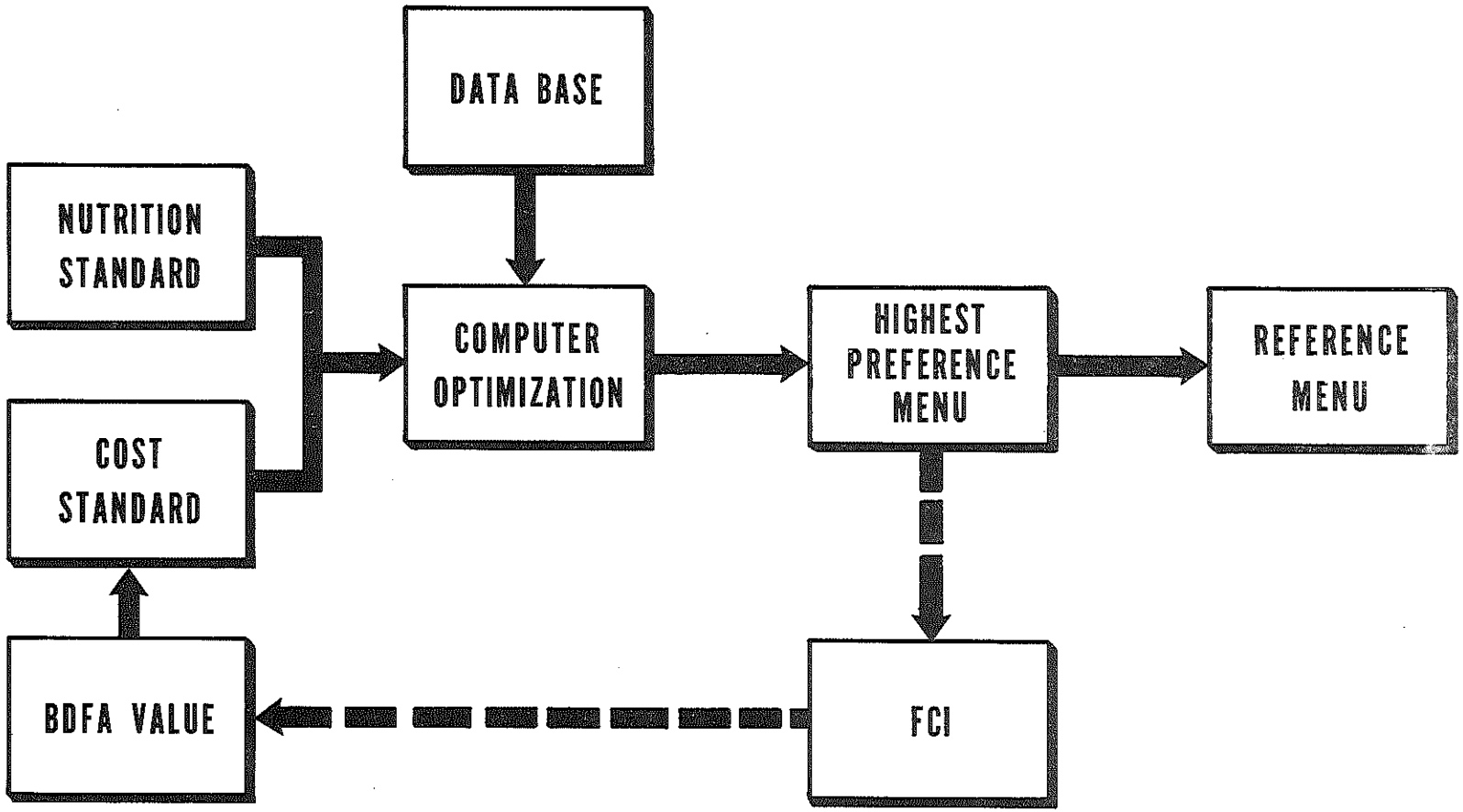


**FIG. 6. URL WITH NUTRITION-COST STANDARDS**

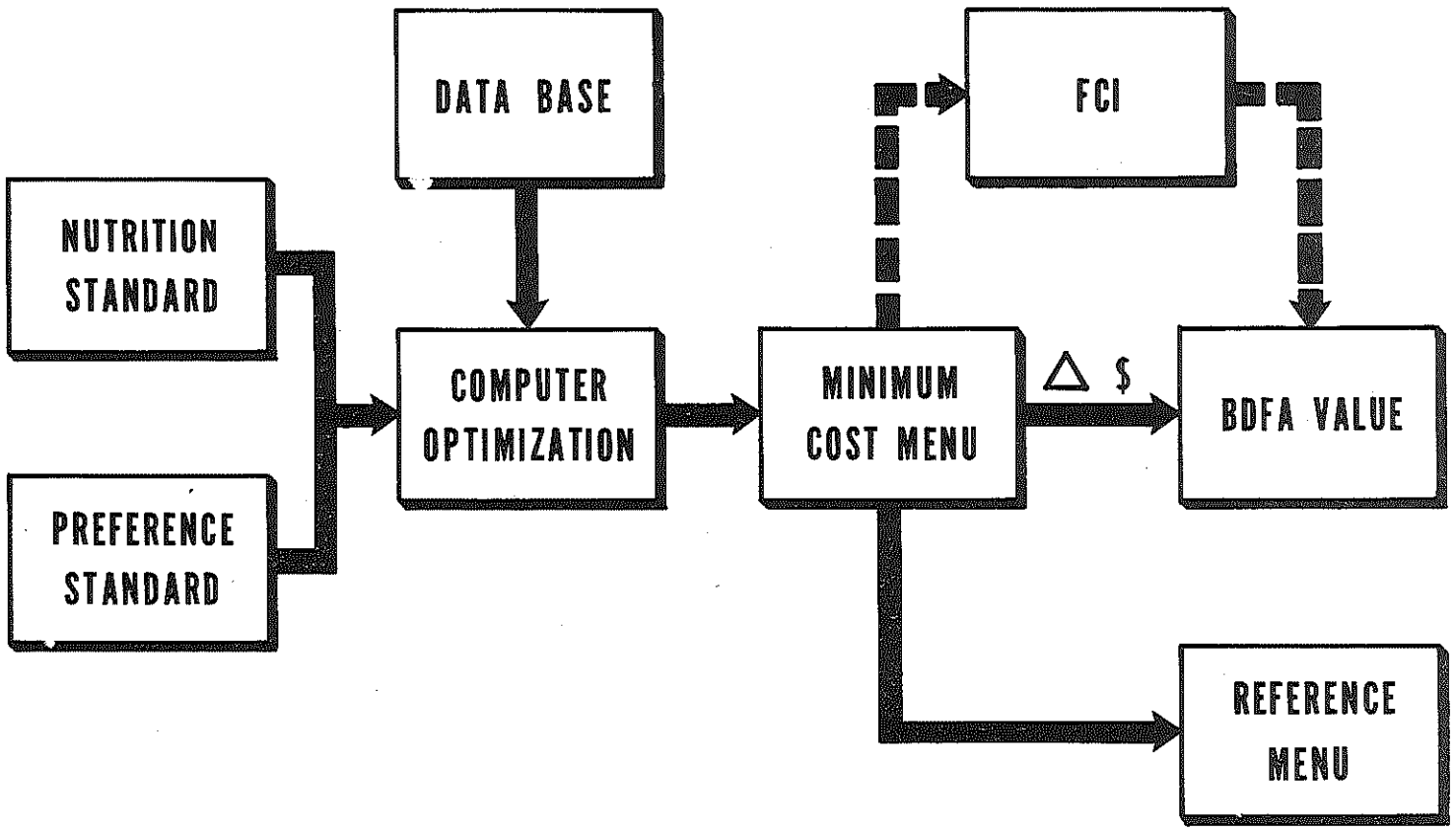


**FIG. 7.URL WITH NUTRITION-PREFERENCE STANDARDS**

Reference menus consistent with nutrition – preference – cost optimization can be designed "by hand" or by use of computers. The advantage of the hand method is that it can be done now. An attempt at a high preference menu by study team members resulted in a higher preference menu than the "42 Day Armed Forces Menu" at about the same average ration cost (BDFA), even though the Master Menu itself is designed to be high in preference. A further interesting feature of this sample high preference menu is that there are 209 recipes in it as opposed to 416 in the Master Menu. Thus, there are possible logistics and training advantages in this concept. The obvious disadvantage of the hand design method is that is most difficult and time consuming to achieve optimization.

By using computer analysis, however, true optimization becomes feasible. Progress has been made in applying mathematical programming techniques so that computer analyses can now provide assistance to professionals undertaking menu design. For example, the frequency of serving menu items in a cyclic menu can be determined on the basis of maximizing preference subject to cost and nutritional constraints. Additional work is needed in the areas of selective menus and food compatibilities to achieve the required overall capabilities.

Aside from the technical aspects of how the reference menu is developed, there remains the question of the desirability of using a reference menu (hence the optimization approach) as a basis for the FCI. Fundamentally what is desired is a uniform ration cost system which, as stated in the program objectives, is "directly related to known consumer requirements." Since this is basically achieved through the types and quantities of foods offered, it is important that the URCS provide sufficient funds so that a good quality ration can be offered. Therefore, the FCI should contain food components that represent the "consumer requirements." One approach to this need is to base the FCI on food utilization data under the assumption that what is being procured reflects consumer preferences. As a result of a study conducted in this program, appreciable utilization data is now available from all four services, and a new FCI can be based on this information. However, food utilization data is only indirectly an indication of consumer preferences since it may reflect a number of other considerations such as the personal preferences of the menu planner(s), the economic and other constraints under which dining facilities were operating, and the availability or non-availability of certain foods in the supply system. On the other hand, a preference-oriented menu as a basis for the FCI is a more direct "grass roots" route to the consumer's "likes" than utilization data. Whereas utilization data indicates where military food service has been, preference data can be used as a basis for a goal to which the system should go. Such data is now available for the four services, and well-supported reference menus can therefore be developed. This approach has intuitive as well as practical appeal in view of the fact that a menu is a visible and tangible basis for an index, being more so than a list of foods that have little discernible association with menus. Further, the selected menu which is the basis for the index

can be provided to food service managers as a guideline. Although this high preference menu could be served in many installations, this would not be required, just as there is no current requirement that the components of the NRL and FCI be purchased. In view of these considerations, the reference menu approach to the FCI development is considered logical and desirable and should be implemented. Until such an approach is adopted, the food utilization data should serve usefully as a basis for near term improvements in the FCI.

## TOTAL COST CONTROL SYSTEM

This type of system departs from the procedure of controlling food costs only and directs itself to the higher level issue of the costs and performance of total food service systems. The desirability of this step results from the observation that food is but one of many food service system elements that require cost control, and this is further underlined by data which reveal that the cost of food in a representative military food service system is considerably less than 50% of the total system cost. The reason for the past and present focus on food cost control is the DoD budget structure which places fiscal controls at the element levels (e.g., military personnel, food, civilian personnel, other operations and maintenance, military construction, etc.) rather than at the food service system level. In reviewing the ration cost systems of nine foreign military organizations and six U.S. institutions it has been found that their controls are very similar to those in DoD, illustrating that this form of control is currently typical in institutions.

The problem with this approach is that it makes it very difficult to make intra-system trade-offs which will improve overall cost and benefits. That is, food service management cannot transfer funds between food and labor, for example, in the interests of realizing a better system. On the other hand, flexibility of this sort is common in arriving at budgets and controlling costs in commercial food service establishments since their management necessarily focuses on the systems level (with "bottom line" emphasis) rather than at the labor, food, equipment, and other sub-levels.

The only departure that is customarily permitted from the BDFA in DoD is to add a percentage to it for food service systems that qualify for supplemental (small units) or special allowances. Under a total cost approach which would provide greater flexibility, the cost of the ration would be authorized to vary from the regular BDFA, with compensating corrections imposed on the cost of other system elements. It is envisioned that decisions to permit these types of variations would apply only for designated types of food service systems--for example, a particular class of ship.

One concept for this innovation is shown in Figure 8. In this situation a new FCI consistent with a URL is assumed to be operative. A military service has a food service system which it feels would operate more effectively under other than normal manning levels and food cost (BDFA) controls. A cost-benefit analysis is performed to provide

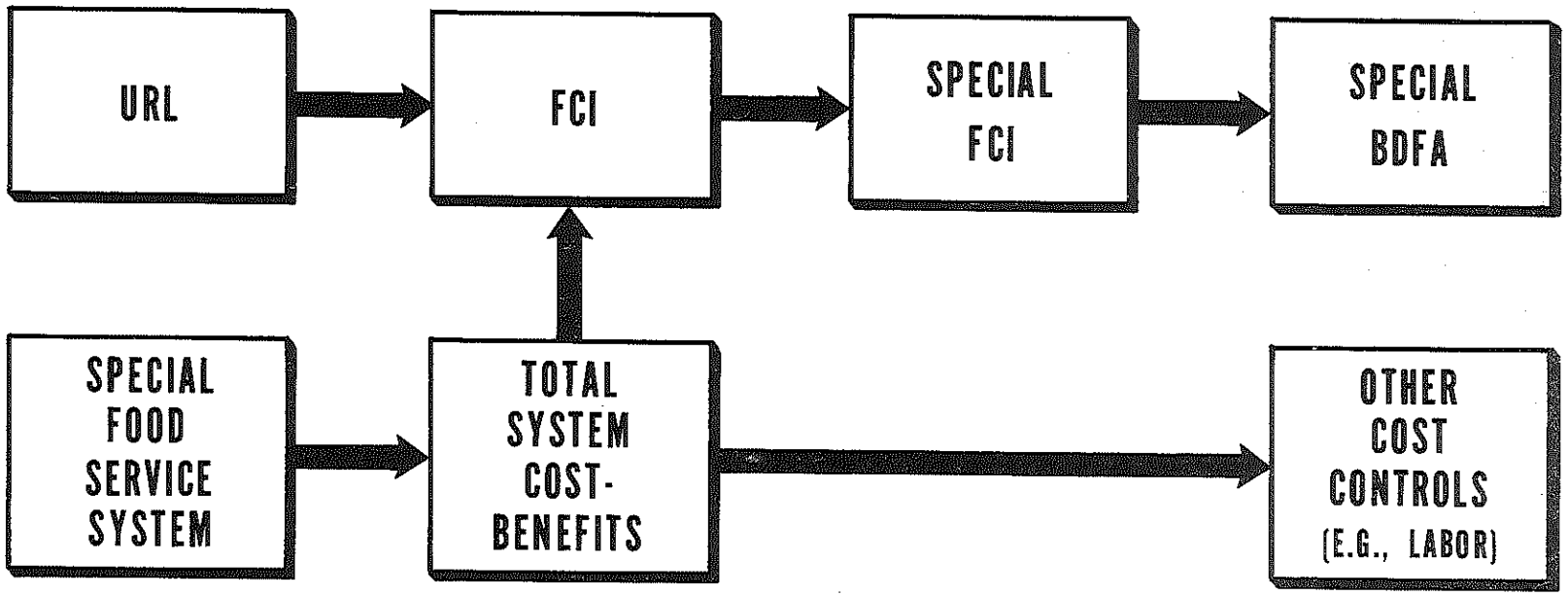


**FIG. 8. URL WITH TOTAL SYSTEM COST CLAUSE**

a basis for a special proposal. In the case shown the result is a special FCI designed for the system. This FCI could have a different set of components (for example, it might contain a number of frozen pre-cooked "convenience" items), or it might simply provide for arriving at a special BDFA value by applying an incremental fixed percentage to the standard FCI. At any rate, the special BDFA would then apply routinely for this type of system. As indicated in the figure, changes would be expected to be imposed on other elements of the system (e.g., reducing the allowed number of food service personnel), thus reducing these costs if food costs are allowed to increase.

One key to this approach is to have enough data to establish a case for the desired deviation. It is because there is insufficient comprehensive cost and performance data on the myriad DoD food service systems at this time that it is recommended that the concept be applied strictly on a case-by-case rather than provide generalized guidelines which would apply for any case that might arise. However, even to achieve this limited amount of flexibility in the URCS should require proper authority. The proposed method is to include a clause in the URL permitting the Secretary of Defense to depart from the provisions of the law which establish the monetary value of the BDFA in those cases in which system benefits could be realized without increasing total costs.

Students of the NRL are aware that Section 6083, Title 10, U.S. Code, states "If the Secretary of the Navy considers it undesirable to administer the mess of any ship or at any stations under the quantity allowance prescribed in section 6082 of this title, he may fix the cost of each ration for that mess." Thus, what is recommended for the URL is to elevate this type of responsibility to the Secretary of Defense level and to include a statement concerning total system cost and benefits. Under this approach, it would be expected that the requests for variance from the uniform cost of food (BDFA) would originate from the services for particular food service systems either in use or contemplated in that service and that such requests would include appropriate system economic and benefit analyses.

## SUMMARY

This review has involved a summary discussion of several types of ration cost systems that may be considered candidates for a URCS. These alternative systems include:

- Monetary Control
  - Current DoD System
  - Contractor Operated Current System
  - All SIK System

- All BAS System (Government Operation)
- All BAS System (Pay Deduction)
- All BAS System (Non-Government Operation)
- Negotiated Budget System

- Food Control
  - Food Plan (Commodity Group Control)
  - Food Plan (Issue Point Control)
  - Annual Food Plan (Fixed Cost)

- Monetary or Food Control
- Monetary and Food Control
- Optimization Control
- Total Cost Control

In analyzing the suitability of these systems for a DoD URCS, several factors merit consideration. These include:

a. Food prices. The extent to which food can be provided at the same price in the same time period at different usage points in the food distribution system can affect the form of the ration cost system. Generally, food control systems are utilized if equal pricing is not practicable.

b. Food supply. Some organizations either do not have their own food supply system, or they have a system which only supplies certain types of items. The ration cost system must be adaptable to the existing supply situation. For example, if perishable foods must be procured from local vendors, the system must include suitable monetary provisions.

c. Work load. Whether the food service system feeds a relatively constant or widely varying number of customers can affect the form of the ration cost system. If the latter situation prevails, a fixed cost or negotiated cost approach is unlikely to be satisfactory.

d. Operating conditions. The ration cost system must be suitable for the various environments in which food service may occur. Principal variables include the number of installations or feeding points, whether they are fixed or mobile, the distance and areas involved, number of people fed, types of people fed (ethnic groups, types of forces, etc.), and the climates encountered. A ration cost system for an organization that operates only large institutions at fixed locations within a modest sized geographical area is very likely to differ from one responsive to all types of missions and locations of a large military organization.

e. Time period of cost control. Normally a ration cost system operates at a constant budget or a constant per person per day food cost rate over a defined time period. For example, the BDFA rate remains constant for one month at present, while many other systems control to fixed budgets for a quarterly period. The longer the period during which it is desired to fix food costs, the greater the need for the ration cost system to include factors which provide "protection" for the organization and the customer. If a firm, fixed annual budget for food is desired under current food cost conditions, fairness to the consumer would indicate that the budget should include an inflation factor to seek to compensate for anticipated price increases.

f. Level of control. The organizational level at which food selection and cost control takes place is important in ration cost system design. This can vary from being at the dining facility or at the food issue (supply) point or the installation level, on up to central headquarters control. Generally, the smaller and less geographically spread the organization is, the more likely it is to be rather tightly controlled from headquarters. Such centralized control becomes increasingly difficult as the size and diversity of the organization increases and as more emphasis is placed on meeting local food preferences.

Looking now at the above listed ration cost systems, the following summary comments are made:

—**Existing DoD System.** This system works generally well although there are a number of areas of potential improvement, as pointed out in Section II. It is and has been a very adaptable system in that it can take on a number of forms to fit various situations. Even though originally designed to be a food control system, its operation has evolved into a monetary control system. It places emphasis on menu planning and cost control at the local level, hence providing a degree of flexibility in meeting consumer requirements that is desirable in any new system. Although annual food budgets are prepared, actual food expenditures are normally permitted to vary from budgetary estimates in order to provide a constant quality of feeding. In view of the proven effectiveness of the current system, this type of system offers excellent potential as a basis for a new URCS in the intermediate time period.

—**Contractor Operation.** This is one version of the preceding system, and it may itself take various forms involving contractor labor or food and labor. Certain contractor operations that have been evaluated to date have been shown to provide cost and effectiveness improvements over standard government operated systems. However, this approach is not acceptable for certain feeding situations (e.g., shipboard and field feeding). Further, the need for the services to maintain a trained supply of food service personnel for such situations makes it necessary to place limits on the use of contracting.

—**All SIK.** Normally all enlisted personnel are on SIK in shipboard and field feeding assignments at this time so this is not a completely new system at the organizational level. If applied extensively in all services, it would treat all members fairly, and it would be rather simple to apply. Even though attendance would probably increase, it is expected that this would be the least expensive alternative in view of the savings to the government from missed meals. Nonetheless, this approach is definitely undesirable from a morale standpoint and is not compatible with all volunteer force considerations.

—**All BAS (Government Operation).** Ranks very high in terms of consumer morale, fairness to all users, and efficiency of monetary and food controls. The cost will probably be appreciably higher than the present system. Overall evaluation of this system should await current and planned testing by all services because it is not equally suitable for all operational situations. Since it is not appropriate for all types of feeding, some form of SIK system should be retained even if this type of system is more widely adopted.

—**All BAS (Pay Deduction).** Does not represent a major change over the current system in its basic concept. This system is most pertinent to a "single pay" military compensation situation.

—**All BAS (Non-Government Operation).** This is a form of all BAS system in which the operator(s) would not be under government contract but would sell on base directly to the military consumer, much like the Exchange System functions now. Aside from the aforementioned problem of maintaining trained military food service personnel, this approach would necessitate arriving at a higher BAS rate adequate to compensate for non-food costs. This does not, however, necessarily mean that the system would be more costly overall.

—**Negotiated Budget.** This type of system is not suitable for adoption under current military budgeting and fiscal controls because a military commanding officer does not have control over all installations funds. He can not, therefore, allocate or trade-off total funds into functional areas in the manner suggested by this approach. Even if feasible, the system would present an additional problem in that it would be virtually impossible to provide a consistent ration —— hence fairness to all personnel —— throughout DoD.

—**Food Plan (Commodity Group Control).** This system is equivalent to subsistence-in-kind type of control, and it could work adequately in DoD. However, the present DoD system offers a well-balanced diet without this form of control. The present system also offers most food items at a single price at all locations, and hence food control is not required to realize a consistent ration. Overall, a monetary control system is viewed as being more appropriate than a food control approach for the flexibility desired for DoD food service. At least one organization that has used this type of system is now leaning toward monetary control.

—**Food Plan (Issue Point Control).** This ration control approach was previously used in DoD as the field ration system. It has been replaced for garrison type feeding by the monetary control system for several reasons, including the improved flexibility and consumer acceptance provided by local menu planning. This system remains relevant as a variation of the present system under certain supply—constrained operations, such as field feeding.

—**Annual Food Plan (Fixed Cost).** This system works satisfactorily in an organization with fixed locations, a stable work load and no major supply problems. Certain features of the system (e.g., automated approach to procurement and delivery) are worthy of consideration for DoD installations with similar characteristics. However, this would not be an appropriate ration cost system for DoD as a whole.

—**Monetary or Food Control.** The present system already has this optional feature since it is a monetary control system with the freedom to shift to a field ration type of food control system if required. There appears to be no requirement for a new DoD system of this type.

—**Food and Monetary Control.** If DoD used a food plan system, having the monetary control option for local purchase items would be a reasonable approach. However, there is no need for this type of split system under the current monetary control method.

—**Optimization Control.** This approach has considerable potential for longer term application. It can interface directly with a monetary control system and provide the capability to develop a food cost index based on a reference menu that provides the best combination of nutrition, preference and cost within reasonable constraints. The menu and index are adjusted to meet consumer needs as changes in these parameters (e.g., food prices) occur.

—**Total Cost.** Cost control at the food service system level, rather than at the subsystem or element level, is intuitively attractive and logically defensible. A legal means for permitting this to occur is required, and application on a case-by-case basis, probably limited to food and labor initially, has been suggested.

The initial and continuing thrust of this program has been to define a URCS based primarily on analysis and subsequent improvement of the current system. The foregoing exploratory examination of alternative forms of systems indicates that the initial emphasis has been, in fact, the correct one. Some of the systems reviewed, such as negotiated budgets and annual food plans, are clearly unsuitable for DoD. Other types of control systems, such as commodity group food plans, could be used but generally the conditions that make them useful elsewhere are not found in DoD. The current system not only is based on monetary control, which is preferred to food control, but also it tolerates wide variation in its various applications, ranging from All SIK to All BAS. In fact, several of the alternatives can be regarded as different forms of the present system. For example, it can currently also accommodate government or non-government operation and mixes of the two. Further, the present system is readily capable of absorbing the features described under optimization and total cost control. It is therefore concluded that the basic framework of the URCS should be that of the existing ration cost system. This conclusion in no way detracts from program efforts to improve the current system by correcting its deficiencies, making it more consistent and uniform, and in general refining and modernizing it.

## SECTION V

## THE LEVEL OF FEEDING

### OBJECTIVE

An essential element of any ration cost system is the basis that is incorporated in the system for establishing the quality of feeding for the organization served. All ration cost systems contain such a basis or standard. Generally it takes the form of a list of nutritionally balanced foods allowed on the average for one person for a specified period of time, such as a day. Some organizations set the feeding level in terms of a cash allowance which is either determined at central headquarters or negotiated locally between management and the food service administration.

In virtually all cases the basis for the ration has evolved over the years from an earlier standard. In some cases the change has been dramatic. For example, the first Navy Ration Law was passed by the Congress in 1794 and provided a typical day's ration of one pound of hard bread, one and one-half pounds of salt beef, one-half pint of rice and included a half-pint of distilled spirits or one quart of beer (Appendix A). This may be contrasted with the current NRL (passed in 1933) which is shown in Figure 3. Undoubtedly, as suggested by the Secretary of the Navy[23] in 1933, the evolutionary changes in military feeding have occurred because of changes in food preservation, better knowledge of the relationship between diet and nutrition, changes in living and working conditions, and the general nature of feeding in civilian life. This statement notwithstanding, a review of ration history leads to the conclusion that the military standard of feeding has been established on the services' perception of their needs rather than on comparison with the quality of food offered in U.S. civil life. While this approach is understandable, it does not yield the factual information required to respond in a definitive fashion to critics who assert that the military is feeding either poorly or too well. Perhaps of greater importance, military versus civilian comparative food usage data has not been available in presenting and justifying DoD food budgets to the Congress. Finally, it has become increasingly common in the US and other countries to place military pay and benefits on a comparable basis with civilian compensation. Food is, of course, part of the military benefits package and should be included in such analyses.

[23] "Effect Needed Changes in the Navy Ration," 72nd Congress, 2nd Session, Report No. 1292, 21 February 1933.

In describing the need for the URCS Program, the Director of Defense Research and Engineering stated[24] that it "must develop a scientifically defensible way of uniformly determining ration costs." As a result of this requirement and of similar guidance provided by the program's interservice review committee, there has been a study objective[25] to perform "an analysis of current DoD food consumption data and comparison of the level of feeding in the armed forces with that of representative civilian groups." This section summarizes the results of that analysis. For more complete information on the subject the reader is referred to "The Basic Level of Feeding: A Comparison of Military and Comparable Civilian Food Utilization," U.S. Army Natick Laboratories Technical Report 75-43-OR/SA.

The importance of this analysis transcends its interest and value for purely comparison purposes. The results are regarded as an "anchor point" for the URCS that is proposed. That is, the evaluation affords a specific and quantitative means for placing military feeding on an equivalent basis with that of comparable civilian organizations. As such, the findings become a keystone element in the development of URCS and in proposals for its periodic revision.

## APPROACH

The analysis has been designed to compare and evaluate the basic food procured for use in military dining facilities with that purchased for use in selected civilian operations that parallel military feeding. No attempt has been made to assess the other factors that affect consumer acceptance, such as the proficiency of food preparation, the specific menus served, and the environment in which eating occurs. The consideration of such a diverse set of factors was beyond the scope and objective of the effort.

The following general characteristics were selected to identify those civilian organizations that would be comparable to military populations in terms of feeding requirements:

- age and sex distribution, caloric expenditure, and nutritional requirements
- meals served free as part of compensation (or prepaid)
- three meals a day served
- voluntary participation in the activity providing feed

[24] Foster, John S., Memorandum for Assistant Secretary of the Army (R&D), Subject: Fiscal Year 1973 Joint Food RDT&E Program & Guidance to the Joint Formulation Board, 14 August 1972.

[25] Technical Plan, Uniform Ration Cost System Program, 1 June 1973.

Since no single civilian operation is exactly comparable to the military, a number of different types of organizations have been included in the survey so as to provide a range of situations with characteristics encompassing those of the military. Even so, the above criteria were necessarily used as general rather than rigid guidelines in selecting the civilian case studies. In view of the fact that a number of organizations were considered suitable for inclusion in the survey, the final choice was determined by the availability of suitable records of item by item food utilization and meal attendance.

The five organizations chosen for study were:

1. a state university with university operated food service
2. a professional football team during training camp
3. a law enforcement academy with contract caterer food service
4. an off-shore oil drilling installation with contract caterer food service
5. a merchant marine ship during a 45-day voyage

The method used was to secure precise information on all of the food used in the preparation of meals served during a specified time period for which the number of meals could be exactly determined. To be consistent with the DoD data, the meals were converted into number of rations by summing 20% of the number of breakfast meals served, 45% of the dinner meals served, and 35% of the supper meal count. Once the data on the utilization of a particular food item during the survey period had been entered into the system along with the associated number of rations served in that period, the quotient yielded the average utilization per ration. Food utilization was determined by food purchases during the period, corrected for beginning and ending inventories.

The analytical comparison of food usage experience in the civilian sector with that of the military was performed with respect to:

- utilization (quantity),
- expenditures (cost),
- quality, and
- nutrition.

Utilization comparisons were made on a food group by food group basis, (e.g. vegetables) with item by item detailed information providing the explanation for any differences noted. The utilization per ration data provided the basis for the expenditure, quality and nutritional comparisons, which have also been presented in terms of food groups. In determining expenditures all civilian usage data was costed item by item on the same basis as military usage data. That is, the 1 June 1974 Defense Personnel Supply Center (DPSC) food prices were applied to both, thus yielding a standard "military equivalent cost" for a consistent comparison.

## RESULTS

### UTILIZATION

Food utilization data for all organizations are displayed in Table 4. DoD data here and throughout the analysis are taken directly from another URCS report[5]. It should be noted that a comparison of total weights and percentage of ration in this table can be misleading in terms of the quality of the diet since a pound of potatoes or carbonated beverage contributes the same quantity as a pound of high quality beef. Overall, the total weight of the DoD ration (6.69 lbs) is lower than the football team and off-shore oil crew and greater than the others. However, three of the organizations provide appreciably more lbs./ration of the generally expensive meat, poultry, fish group than DoD. The law enforcement academy is noticably low in this group.

Table 5 summarizes average civilian food utilization as a percentage of DoD utilization. Recognizing that the professional football team, with its exceptionally high caloric and protein requirements, unduly affects the averages in certain groups, civilian data have been recalculated excluding the football team and are so presented in Table 6. It will be noted that food utilization for the civilian situations for the majority of the food groups falls within ± 15% of the DoD figure. In terms of certain high usage groups, DoD exceeds the civilian average in milk and milk products but is lower in meat, poultry, fish.

### EXPENDITURES

Table 7 presents the military equivalent expenditures, as previously defined, for the various food groups. The total expenditures range from a minimum of $1.76 to a maximum of $4.13. DoD expenditures most closely parallel those of the state university. The data readily reveals that the meat, poultry, fish group represents the most significant contribution to the total ration cost (44% in the case of DoD).

TABLE 4

Food Utilization by Major Food Groups

(Pounds Per Ration and Percent of Ration)

| | State University Students | | Professional Football Team | | Law Enforcement Academy | | Off-Shore Oil Crew | |
|---|---|---|---|---|---|---|---|---|
| | Lbs. | % | Lbs. | % | Lbs. | % | Lbs. | % |
| Meat, Poultry, Fish | .8379 | 14.03 | 1.9728 | 21.37 | .5882 | 11.01 | 1.3307 | 16.11 |
| Eggs | .1118 | 1.87 | .3154 | 3.42 | .2061 | 3.86 | .1347 | 1.63 |
| Milk & Milk Products | 2.0838 | 34.88 | 1.6672 | 18.06 | 1.3956 | 26.12 | 1.5189 | 18.39 |
| Beverages | .3062 | 5.14 | 1.6077 | 17.42 | .5437 | 10.17 | 1.9601 | 23.73 |
| Vegetables | .8012 | 13.41 | 1.1939 | 12.93 | .8783 | 16.44 | .9402 | 11.38 |
| Legumes & Nuts | .1558 | 2.61 | .0729 | 0.79 | .1545 | 2.89 | .1592 | 1.93 |
| Grain & Cereal Products | .5877 | 9.84 | .7453 | 8.07 | .5944 | 11.12 | 1.1341 | 13.73 |
| Fruits | .5023 | 8.41 | .9607 | 10.41 | .3184 | 5.96 | .5149 | 6.23 |
| Fats, Oils, & Salad Dress. | .1541 | 2.58 | .0790 | 0.86 | .1954 | 3.66 | .1985 | 2.40 |
| Sugars & Sweets | .1858 | 3.11 | .2087 | 2.26 | .2034 | 3.81 | .2221 | 2.69 |
| Soups & Gravies | .0750 | 1.26 | .1638 | 1.77 | .1331 | 2.49 | .0497 | .60 |
| Condiments | .1406 | 2.35 | .1644 | 1.78 | .1325 | 2.48 | .0828 | 1.00 |
| Specialty Items | .0314 | 0.53 | .0782 | 0.85 | — | — | .0146 | .18 |
| Total | 5.9736 | 100.00 | 9.2300 | 100.00 | 5.3436 | 100.00 | 8.2605 | 100.00 |

TABLE 4

Food Utilization by Major Food Groups

(Pounds Per Ration and Percent of Ration)
(Continued)

| | Merchant Marine Ship | | Civilian Average | | Civilian Range | | DoD Composite | |
|---|---|---|---|---|---|---|---|---|
| | Lbs. | % | Lbs. | % | Min. | Max. | Lbs. | % |
| Meat, Poultry, Fish | 1.4881 | 26.07 | 1.2435 | 18.00 | 0.5882 | 1.9728 | .9796 | 14.64 |
| Eggs | .1888 | 3.31 | 0.1914 | 2.77 | 0.1118 | 0.3154 | .2202 | 3.29 |
| Milk & Milk Products | .8905 | 15.60 | 1.5112 | 21.87 | 0.8905 | 2.0838 | 2.1075 | 31.50 |
| Beverages | .3218 | 5.64 | 0.9479 | 13.72 | 0.3062 | 1.9601 | .3570 | 5.34 |
| Vegetables | 1.2188 | 21.35 | 1.0065 | 14.57 | 0.8012 | 1.2188 | 1.1118 | 16.62 |
| Legumes & Nuts | .0695 | 1.22 | 0.1224 | 1.77 | 0.0695 | .1592 | .1587 | 2.37 |
| Grain & Cereal Products | .5527 | 9.68 | 0.7228 | 10.46 | 0.5527 | 1.1341 | .7235 | 10.81 |
| Fruits | .6202 | 10.86 | 0.5833 | 8.44 | 0.3184 | 0.9607 | .4502 | 6.73 |
| Fats, Oils, & Salad Dress. | .1144 | 2.00 | 0.1483 | 2.15 | 0.0790 | 0.1985 | .1597 | 2.39 |
| Sugars & Sweets | .1555 | 2.72 | 0.1951 | 2.82 | 0.1555 | 0.2221 | .3528 | 3.79 |
| Soups & Gravies | .0091 | .16 | 0.0861 | 1.25 | 0.0091 | 0.1638 | .0174 | 0.26 |
| Condiments | .0754 | 1.32 | 0.1191 | 1.72 | 0.0754 | 0.1644 | .1249 | 1.87 |
| Specialty Items | .0042 | .07 | 0.0321 | 0.46 | 0.0042 | 0.0782 | .0262 | 0.39 |
| Total | 5.7090 | 100.00 | 6.9097 | 100.00 | 5.3394 | 9.1578 | 6.6905 | 100.00 |

## TABLE 5

### Civilian Food Utilization as a Percentage of DOD Utilization

| | Civilian Average | Range |
|---|---|---|
| Meat, Poultry, Fish | 127 | 60 – 202 |
| Eggs | 87 | 51 – 143 |
| Milk & Milk Products | 72 | 42 – 99 |
| Beverages | 266 | 86 – 549 |
| Vegetables | 91 | 72 – 110 |
| Legumes & Nuts | 77 | 44 – 100 |
| Grain & Cereal Products | 100 | 43 – 157 |
| Fruits | 130 | 71 – 213 |
| Fats, Oils & Salad Dressings | 93 | 50 – 124 |
| Sugar & Sweets | 77 | 61 – 88 |
| Condiments | 95 | 60 – 132 |
| Miscellaneous | 271 | 31 – 555 |
| Total | 103 | 80 – 138 |

## TABLE 6

### Food Utilization as a Percentage of DOD Utilization

| | Civilian Average* | Range* | Professional Football Team |
|---|---|---|---|
| Meat, Poultry, Fish | 109 | 60 – 152 | 202 |
| Eggs | 73 | 51 – 194 | 143 |
| Milk & Milk Products | 70 | 42 – 99 | 79 |
| Beverages | 219 | 86 – 549 | 450 |
| Vegetables | 87 | 72 – 110 | 107 |
| Legumes & Nuts | 85 | 44 – 100 | 46 |
| Grain & Cereal Products | 89 | 43 – 157 | 103 |
| Fruits | 109 | 71 – 138 | 213 |
| Fats, Oils & Salad Dressings | 104 | 72 – 124 | 50 |
| Sugar & Sweets | 76 | 61 – 88 | 82 |
| Condiments | 86 | 60 – 113 | 132 |
| Miscellaneous | 182 | 31 – 305 | 555 |
| Total | 94 | 80 – 123 | 138 |

*Excluding Football Team

TABLE 7

Military Equivalent Food Expenditures[1]
(In $/Ration)

| | Law Enforcement Academy | Professional Football Team | State University Students | DoD |
|---|---|---|---|---|
| Meat, Poultry, Fish | .556 | 2.376 | .895 | 1.006 |
| Eggs | .077 | .139 | .049 | .086 |
| Milk & Milk Products | .254 | .349 | .403 | .384 |
| Beverages | .168 | .291 | .078 | .091 |
| Vegetables | .194 | .315 | .168 | .220 |
| Legumes & Nuts | .043 | .026 | .054 | .043 |
| Grain & Cereal Products | .156 | .207 | .160 | .177 |
| Fruits | .056 | .188 | .100 | .091 |
| Fats, Oils & Salad Dressing | .079 | .032 | .070 | .063 |
| Sugar & Sweets | .070 | .067 | .069 | .066 |
| Condiments | .062 | .059 | .067 | .035 |
| Miscellaneous | .047 | .082 | .040 | .020 |
| Total[2] | 1.761 | 4.129 | 2.152 | 2.283 |

[1] Civilian utilization priced at June 74, DPSC item prices.

[2] Totals may not add due to rounding.

TABLE 7

Military Equivalent Food Expenditures[1]
(In $/Ration)
(Continued)

| | Merchant Marine Ship | Off–Shore Oil Crew | Civilian Average[2] | DoD |
|---|---|---|---|---|
| Meat, Poultry, Fish | 1.640 | 1.577 | 1.167 | 1.006 |
| Eggs | .071 | .051 | .062 | .086 |
| Milk & Milk Products | .212 | .302 | .293 | .384 |
| Beverages | .164 | .165 | .144 | .091 |
| Vegetables | .269 | .171 | .201 | .220 |
| Legumes & Nuts | .019 | .042 | .040 | .043 |
| Grain & Cereal Products | .165 | .349 | .208 | .177 |
| Fruits | .107 | .073 | .084 | .091 |
| Fats, Oils & Salad Dressing | .052 | .084 | .071 | .063 |
| Sugars & Sweets | .043 | .056 | .060 | .066 |
| Condiments | .025 | .025 | .045 | .035 |
| Miscellaneous | .005 | .037 | .032 | .020 |
| Total[3] | 2.733 | 2.932 | 2.395 | 2.283 |

[1] Civilian utilization priced at June 74 DPSC item prices.

[2] Excluding Football Team.

[3] Totals may not add due to rounding.

Table 8, which compares civilian expenditures by food group with DoD expenditures, shows more clearly than Table 7 the relative amount of money spent by civilian operations as opposed to the military. Overall, the civilian average expenditure is higher in six groups and lower in six groups, but it is five percent higher overall--again the football team is excluded from the averages.

## QUALITY

As a generalization of the specifications applied in food procurement, it may be said that the civilian operations tend to use equivalent or better grades of meat, poultry, eggs, butter, and ice cream than DoD, but DoD requirements for processed fruits and vegetables tend to be higher than those used by some of the civilian operations.

The data indicate that DoD uses an appreciably larger number of individual basic food items than the other organizations. This is probably indicative of greater variety in the DoD menus or more complex recipes.

If the animal protein utilization (meat, poultry, fish, eggs and dairy products) is examined as an indicator of quality, DoD is second highest due primarily to its high milk usage. In expenditures for animal protein foods, DoD is higher than two organizations but lower than three.

Table 9 summarizes usage quantities of certain foods from which quality inferences can be drawn. These inferences are presented in the form of ratios which are taken as indicators of relative quality. Although somewhat subjective, these ratios are intended to compare the per ration usage of better items to less desirable items. For example, the utilization of and expenditure for "cuts of meat to diced and ground meat" is higher for the civilian groups than DoD in every case except the law enforcement academy. In reviewing these indicators the reader should give consideration to peculiarities which characterize certain situations. The off-shore oil crew, for example, is located in the Gulf of Mexico where shell fish (shrimp) are readily available and represent a regional preference. The off-shore oil station and merchant marine ship use appreciable canned products because of supply and storage factors. High DoD butter usage results largely from the fact that the Navy and Marine Corps use butter almost exclusively because of the provisions of the Navy Ration Law. Reference should be made to U.S. Army Natick Development Center TR-75-43-OR/SA for additional discussion of such considerations. Overall, the quality ratios for DoD are reasonably representative of those experienced by the other organizations. No installation consistently ranks highest or lowest with respect to all of the ratios.

## NUTRITION

The nutrient contents of the foods utilized by the various installations are displayed in Table 10. The data for the civilian groups have been averaged, and ratios of the resulting

## TABLE 8

### Food Expenditures as a Percentage of DoD Expenditures

| | State University Students | Law Enforcement Academy | Professional Football Team |
|---|---|---|---|
| Meat, Poultry, Fish | 89 | 55 | 236 |
| Eggs | 57 | 90 | 162 |
| Milk & Milk Products | 105 | 66 | 91 |
| Beverages | 85 | 183 | 318 |
| Vegetables | 76 | 88 | 143 |
| Legumes & Nuts | 124 | 100 | 60 |
| Grain & Cereal Products | 90 | 88 | 117 |
| Fruits | 110 | 61 | 207 |
| Fats, Oils, & Salad Dressings | 111 | 126 | 51 |
| Sugar & Sweets | 104 | 105 | 101 |
| Condiments | 190 | 175 | 167 |
| Miscellaneous | 194 | 231 | 400 |
| Total | 94 | 77 | 181 |

## TABLE 8

**Food Expenditures as a Percentage of DoD Expenditures (Continued)**

| | Merchant Marine Ship | Off–Shore Oil Crew | Civilian Average* | Civilian Range* |
|---|---|---|---|---|
| Meat, Poultry, Fish | 163 | 157 | 116 | 55 – 163 |
| Eggs | 83 | 59 | 72 | 57 – 90 |
| Milk & Milk Products | 55 | 79 | 76 | 55 – 105 |
| Beverages | 179 | 180 | 157 | 85 – 183 |
| Vegetables | 122 | 78 | 91 | 76 – 122 |
| Legumes & Nuts | 44 | 97 | 91 | 44 – 124 |
| Grain & Cereal Products | 93 | 197 | 117 | 88 – 197 |
| Fruit | 118 | 80 | 92 | 61 – 118 |
| Fats, Oils & Salad Dressings | 83 | 134 | 114 | 83 – 134 |
| Sugar Sweets | 64 | 84 | 89 | 64 – 105 |
| Condiments | 69 | 70 | 126 | 69 – 190 |
| Miscellaneous | 25 | 182 | 158 | 25 – 231 |
| Total | 120 | 128 | 105 | 77 – 128 |

*Excluding the Football Team

## TABLE 9

### Comparison of Selected Quality Indicative Ratios Based on Usage/Ration & Expenditure/Ration

| Quality Indicator Ratios | State University | | Professional Football | | Law Enforcement Academy | |
|---|---|---|---|---|---|---|
| | lbs./ Ration | $/ Ration | lbs./ Ration | $/ Ration | lbs./ Ration | $/ Ration |
| Cuts of Meat to Diced & Ground Meat (1) | 2.15:1 | 3.55:1 | 5.67:1 | 10.34:1 | 0.94:1 | 1.46:1 |
| Shell Fish to Fish | 0.63:1 | 0.78:1 | 0.25:1 | 0.58:1 | 0.00:1 | 0.00:1 |
| Meat to Poultry | 2.09:1 | 4.21:1 | 3.02:1 | 6.38:1 | 6.40:1 | 8.25:1 |
| Total Animal Protein to Total Ration | 0.51:1 | 0.62:1 | 0.42:1 | 0.68:1 | 0.41:1 | 0.50:1 |
| Frozen Orange Juice to Canned Orange Juice | 100.0:0 | 100.0:0 | 0.00:1 | 0.00:1 | 0.01:1 | 0.03:1 |
| Frozen Juice to Canned Juice | 0.90:1 | 1.84:1 | 0.00:1 | 0.00:1 | 0.003:1 | 0.009:1 |
| Fresh & Frozen Vegetables & Legumes to Total Veg. & Legumes (2) | 0.61:1 | 0.65:1 | 0.77:1 | 0.71:1 | 0.60:1 | 0.65:1 |
| Fresh & Frozen Fruit to Total Fruit | 0.42:1 | 0.40:1 | 0.61:1 | 0.57:1 | 0.62:1 | 0.60:1 |
| Rolls & Specialty Bread to Total Bread (3) | 0.86:1 | 0.75:1 | 1.94:1 | 2.30:1 | 0.94:1 | 1.18:1 |
| Ice Cream to Total Dairy Products (4) | 0.04:1 | 0.08:1 | 0.11:1 | 0.18:1 | 0.06:1 | 0.11:1 |
| Butter to Margarine | 0.32:1 | 0.50:1 | 1.00:0 | 1.00:0 | 0.38:1 | 0.58:1 |

Notes:
(1) Total meat excludes sausages, cold cuts, luncheon meats
(2) Vegetables and legumes total includes dehydrated instant potatoes recalculated to reconstituted form, i.e. 1 part solid and 5.5 parts liquid
(3) Civilian figures for rolls include canned brown bread and corn bread
(4) Excludes sherbet

## TABLE 9

### Comparison of Selected Quality Indicative Ratios Based on Usage/Ration & Expenditure/Ration (Continued)

| | Off–Shore Oil | | Merchant Marine | | DOD | |
|---|---|---|---|---|---|---|
| | Lbs./ Ration | $/ Ration | Lbs./ Ration | $/ Ration | Lbs./ Ration | $/ Ration |
| Cuts of Meat to Diced & Ground Meat (1) | 2.68:1 | 3.52:1 | 4.40:1 | 9.57:1 | 1.35:1 | 1.97:1 |
| Shell Fish to Fish | 1.46:1 | 2.40:1 | 0.42:1 | 0.72:1 | 0.82:1 | 1.23:1 |
| Meat to Poultry | 5.07:1 | 11.67:1 | 3.53:1 | 7.57:1 | 4.67:1 | 7.84:1 |
| Total Animal Protein to Total Ration | 0.35:1 | 0.64:1 | 0.45:1 | 0.69:1 | 0.49:1 | 0.65:1 |
| Frozen Orange Juice to Canned Orange Juice | 0.00:1 | 0.00:1 | 0.00:1 | 0.00:1 | 0.97:1 | 2.62:1 |
| Frozen Juice to Canned Juice | 0.00:1 | 0.00:1 | 0.00:1 | 0.00:1 | 0.29:1 | 0.78:1 |
| Fresh & Frozen Vegetables & Legumes to Total Vegetables & Legumes (2) | 0.50:1 | 0.49:1 | 0.75:1 | 0.83:1 | 0.64:1 | 0.65:1 |
| Fresh & Frozen Fruit to Total Fruit | 0.88:1 | 0.85:1 | 0.91:1 | 0.88:1 | 0.64:1 | 0.61:1 |
| Rolls & Specialty Bread to Total Bread (3) | 0.02:1 | 0.02:1 | 0.60:1 | 0.68:1 | 0.27:1 | 0.33:1 |
| Ice Cream to Total Dairy Products (4) | 0.10:1 | 0.18:1 | 0.03:1 | 0.05:1 | 0.04:1 | 0.07:1 |
| Butter to Margarine | 0.00:1 | 0.00:1 | 1.15:1 | 1.78:1 | 4.43:1 | 6.86:1 |

## TABLE 10

### A Nutritional Analysis of Food Utilized

| | Energy (Kcal) | Protein (g) | Fat (g) | Calcium (mg) | Iron (mg) |
|---|---|---|---|---|---|
| Law Enforcement Academy | 3577 | 123.2 | 173.1 | 1316 | 26.0 |
| Professional Football Team | 5617 | 245.4 | 273.1 | 1809 | 34.7 |
| State University | 4316 | 156.7 | 207.0 | 2003 | 24.4 |
| Merchant Marine Ship | 3698 | 170.7 | 209.4 | 1209 | 30.8 |
| Off–Shore Oil Crew | 6144 | 193.1 | 271.9 | 1656 | 28.7 |
| Civilian Average | 4670 | 177.8 | 226.9 | 1598 | 28.9 |
| DOD | 4869 | 172.8 | 220.4 | 1831 | 27.7 |

## TABLE 10

### A Nutritional Analysis of Food Utilized (Continued)

| | Vitamin A (IU) | Thiamine (mg) | Riboflavin (mg) | Niacin (mg) | Ascorbic Acid (mg) |
|---|---|---|---|---|---|
| Law Enforcement Academy | 11,865 | 1.4 | 2.8 | 23.8 | 148.4 |
| Professional Football Team | 11,797 | 2.3 | 3.7 | 46.8 | 240.0 |
| State University | 12,207 | 1.6 | 3.4 | 26.7 | 157.6 |
| Merchant Marine Ship | 29,183 | 2.3 | 2.9 | 36.6 | 185.5 |
| Off–Shore Oil Crew | 9,437 | 2.5 | 3.5 | 36.3 | 141.8 |
| Civilian Average | 14,898 | 2.0 | 3.3 | 34.0 | 174.7 |
| DOD | 10,676 | 2.1 | 3.5 | 31.9 | 173.1 |

averages for each nutrient to the DoD utilization averages are shown in Table 11. The DoD nutrient profile is remarkably close to the civilian average in all areas except calcium and vitamin A. The higher DoD calcium levels are probably explained on the basis of the greater DoD usage of milk and milk products (Table 4). The civilian vitamin A average appears to be distorted by the unusually high consumption of carrots by the merchant marine ship.

The nutritional requirements for military personnel are provided by the Daily Dietary Allowances (DDA's) established by The Surgeon General, and Table 12 has been constructed to provide an indication of how well those standards are met by the level of feeding in each organization. It is of course recognized that civilian standards are established in the NAS-NRC Food and Nutrition Board's Recommended Dietary Allowances. Table 12 shows that with two exceptions, the thiamine content of both the law enforcement academy and the state university, all diets equal or exceed the DDA's. However, the state university population is 50% women (thiamine DDA 1.2 mg), so the thiamine content for the university is 110% of the average male-female DDA.

Since the data collected in this study represent **food utilization** (i.e., food purchased per ration) and not actual **food consumption,** one must be careful about drawing any inferences from the amount of nutrients indicated in Table 12. Two points may be made about the actual significance of these figures: 1) they permit a relative comparison between the different operations, and 2) they should exceed the DDA's by a significant margin in order to ensure that despite preparation and serving food losses and plate food wastage, as well as nutrient losses in cooking and serving, the quantities finally consumed provide the minimum daily requirements of nutrients. This latter consideration results in the observation that the law enforcement academy's diet is, in addition to being low in thiamine, marginally low in energy and niacin with respect to the DDA.

## OVERALL

In giving consideration to all level of feeding factors considered (quantity, cost, quality, and nutrition), the DoD ration is found to be generally comparable to that which is provided in the selected civilian organizations, although marginally lower in a few key areas. This observation also applies when the football team data is excluded from the civilian averages.

Probably the single most effective figure of merit on which to base a quantified judgment on the level of feeding in military and selected civilian organizations is the military equivalent cost (civilian usage costed at military prices). Table 13 displays the observed military equivalent cost per ration experience. Three organizations are shown to be higher

## TABLE 11

### Nutrition Levels of Average Civilian Food

### Utilization as a Percentage of DOD

| | Percentage |
|---|---|
| Energy | 96 |
| Protein | 103 |
| Fat | 103 |
| Calcium | 87 |
| Iron | 104 |
| Vitamin A | 140 |
| Thiamine | 95 |
| Riboflavin | 94 |
| Niacin | 107 |
| Ascorbic Acid | 101 |

TABLE 12

Percent of Daily Dietary Allowances (DDA'S)

Provided by Foods Utilized

| | Energy (Kcal) | Protein (g) | Calcium (mg) | Iron (mg) | Vitamin A (IU) | Thiamine (mg) | Riboflavin (mg) | Niacin (mg) | Ascorbic Acid (mg) |
|---|---|---|---|---|---|---|---|---|---|
| **DDA Value** | **3400** | **100** | **800** | **14** | **5000** | **1.7** | **2.0** | **22** | **60** |
| | % | % | % | % | % | % | % | % | % |
| Law Enforcement Academy | 105 | 123 | 165 | 186 | 237 | 82 | 140 | 108 | 247 |
| Professional Football Team | 165 | 245 | 226 | 248 | 236 | 135 | 185 | 213 | 400 |
| State University Student | 127 | 157 | 250 | 174 | 244 | 94 | 170 | 121 | 263 |
| Merchant Marine Ship | 109 | 171 | 151 | 220 | 584 | 135 | 145 | 166 | 309 |
| Off–Shore Oil Crew | 181 | 193 | 207 | 205 | 189 | 147 | 175 | 165 | 236 |
| Civilian Average | 137 | 178 | 200 | 207 | 298 | 118 | 165 | 155 | 291 |
| DOD | 143 | 173 | 229 | 198 | 214 | 124 | 175 | 145 | 289 |

## TABLE 13

### Total Cost Per Ration at DPSC Prices

| | Percent of DoD Cost | $/Ration |
|---|---|---|
| Law Enforcement Academy | 77 | 1.761 |
| State University Students | 94 | 2.152 |
| DoD | 100 | 2.283 |
| Merchant Marine Ship | 120 | 2.733 |
| Off-Shore Oil Crew | 128 | 2.932 |
| Professional Football Team | 181 | 4.129 |
| Civilian Average | 120 | 2.741 |
| Civilian Average W/O Football Team | 105 | 2.395 |
| DoD | 100 | 2.283 |
| DoD with Programmed Improvements | 106 | 2.415 |

than DoD, the state university is most comparable and the law enforcement academy appreciably lower. If the fact that the state university student population is about 50% female is taken into consideration, it can be estimated that its costs would be about the same as for DoD if it were subsisting a predominantly male population with attendant higher nutritional needs. The lower expenditures of the law enforcement academy could result from a number of factors, but the data do indicate that both lesser amounts and lower priced foods are being used and that nutritional adequacy is questionable with respect to certain of The Surgeon General's DDA's.

As Table 13 indicates, the simple average of per ration expenditures for all five civilian operations was 20% higher than the military. If the implications of the above comments on the state university and the law enforcement academy are ignored and if the football team is dropped from consideration, the resulting expenditure average for the four remaining civilian organizations is still 5% higher than the military.

A brief analysis of comparative **actual** (not military equivalent) costs in other organizations, shown in Table 14, confirms this conclusion. In this case military costs were determined by costing military food utilization at DPSC prices for the particular period covered by the civilian data. A survey of 72 U.S. colleges and universities by the National Association of Colleges and University Food Services indicates very close agreement between military and university feeding costs. Canada was chosen as a representative foreign military organization because its cultural eating habits are considered closest to the U.S. However, the Canadian ration cost system does not incorporate a headcount, so ration cost data at isolated bases where attendance is effectively 100% were used to seek comparability with the DoD data. Although there may be factors, such as the relationship of food to morale at such bases, that contribute to this ration cost, the indications are that the general level of feeding of the Canadian Armed Forces exceeds that of DoD. Finally, the Coast Guard expenditure is marginally higher than DoD and is, in fact, within one percent of the average of the military equivalent food cost of the four civilian operations. The Coast Guard controls on the cost of food vary slightly from those in use within DoD.

Addressing Table 13 again, the entry for "DoD with Programmed Improvements" will be noted. This refers to the costing of a food cost index which was recommended by a special task group of service dieticians in February 1972 and which has been modified to include the usage of uniform federal stock numbered items, the substitution of open market for USDA surplus butter and the substitution of "choice" for "good" quality meats. The adoption of the FCI with these proposed changes is scheduled for fiscal year 1976. On a military equivalent costing basis, this new FCI is shown to be about equal in cost per ration to the civilian average without the football team.

Given the scope and constraints of the data compiled in the previously described surveys and recognizing that certain judgments have necessarily been incorporated in

## TABLE 14

### Comparative Actual Costs to Feed

| Period | Organization | $/Ration |
|---|---|---|
| April – June 73 | 72 Colleges | 2.166 |
| | DoD | 2.145 |
| April – September 73 | Canadian Isolated Bases | 2.680* |
| | DoD | 2.165 |
| April – June 74 | Coast Guard | 2.350 |
| | DoD | 2.284 |

*Canadian Dollars

selecting organizations and in the analysis, the findings of this evaluation lead to the conclusion that the adoption of the above mentioned food cost index, or one that provides an equivalent level of feeding, is reasonable and justifiable for use within DoD.

In the longer term the methodology developed and employed herein should be applied periodically (every four years, for example) to assess the level of feeding of military forces and to make appropriate adjustments in the types, quantity, quality and nutrition of foods provided for military personnel. This methodology includes:

1. the collection of civilian food utilization data within the constraints of general comparability with the military,

2. the use of common food price data in performing cost comparisons,

3. the broad view taken of the quality or level of feeding, and

4. the diversity of criteria utilized in analyzing and comparing the level of feeding.

## SECTION VI

## THE RATION COST COMPUTATION

### INTRODUCTION

The findings presented in preceding sections provide a foundation for recommending the specific form that the uniform ration cost system should take. Section II has indicated those aspects of the ration law and food cost index that merit correction. Based on these considerations and on the necessity for the ration cost system to support and be compatible with the diverse military food service and supply systems, Section III provides a general set of requirements for a modernized URCS. In Section IV a range of candidate forms for the URCS are defined and evaluated. Section V quantitatively addresses the issue of the DoD level of feeding with attention to the quantity, quality, and nutrition of the foods in the ration and with emphasis on determining a reasonable level for the cost of the ration.

The objective of this section is to identify and evaluate the specific alternatives for an improved ration law and food cost index. Although these are not the only elements of a URCS, they are viewed as being most important, and the other elements of the system are contingent on the form chosen for the law and index. Such other URCS elements will be addressed selectively in a separate technical report.

By way of a brief review, the following previously reached conclusions have had the greatest effect on the determination of the preferred form of the URCS:

1. A ration law should be retained. It should provide a visible, stable, easily understandable indication of the intent of the Congress toward the military ration. There should be a single uniform law for all military services.

2. The ration law should provide a quantitative statement of the ration entitlement of the individual member. As such, it should establish a statutory feeding standard.

3. The level of feeding for military personnel should bear a reasonable similarity to that in comparable U.S. civilian organizations. In addition to cost equivalence with such organizations, the military ration should provide foods which satisfy DoD nutritional requirements and yield a high level of consumer acceptance. The ration law and food cost index should therefore be designed with explicit attention to food cost, nutrition and preference.

4. The URCS should permit an essentially constant level of feeding to be maintained in spite of the fluctuating prices of food.

5. The URCS should have adequate flexibility to accommodate all types of military food service systems, supply systems, and environmental and policy variations.

6. The URCS should be periodically reviewed and revised to meet changing technology, requirements, and other conditions.

7. The URCS should permit deviation in the normal monetary value of the basic daily food allowance in those food service systems in which system benefits can be realized without increase in total system costs.

## THE RATION LAW

The preceding findings that there should be a ration law and that it should contain a statutory feeding standard serve to narrow the types of ration cost systems that might be considered as alternatives. For example, even though there are many other institutions that operate ration administration systems without benefit of a ration law, such systems have been eliminated from consideration for DoD use.

The desirability of incorporating a quantitative standard of feeding into the law also serves to eliminate from consideration those laws that operate on a delegation-of-authority principle. Such laws in the past have typically delegated the determination of the composition of the ration to the President or to the Secretary of Defense. For example, the Army Ration Law (Section 4561, Title 10, U.S. Code) reads in part:

> "The President may prescribe the components, and the quantities thereof, of the Army Ration."

The Air Force Ration Law (Section 9561, Title 10, U.S. Code) is similarly phrased. In 1967 the President issued Executive Order 11339 to delegate responsibility to the Secretary of Defense to prescribe the Army and Air Force rations. The Navy Ration Law, which contains a feeding standard in the form of a list of food components (Section 6082, Title 10, U.S. Code), then became applicable for all of DoD when the Secretary issued a uniform food cost index which was based on that law. Delegation-of-authority types of ration laws will not be given further consideration in this report although, as will be subsequently discussed, considerable delegation is recommended with regard to the design of the food cost index.

## Types of Statutory Feeding Standards

As a basic step in developing candidate versions of the ration law, attention will first be directed to the forms that the statutory feeding standard can take. The major options that have been considered for this standard are:

1. A list of foods that represent the specific types and quantities that are to be utilized.

2. A list of foods that are used to determine the allowed cost of the ration without imposing the requirement that the foods be utilized.

3. A specific cost of the ration, applicable for a particular date.

4. A reference embodying a combination of cost, nutrition, and preference considerations.

The first option characterizes food control, or food plan, systems. In such systems the dining hall is constrained to use specified quantities of foods (on a per ration basis) within stated food groups. Thus, the feeding standard is effected by control of actual food issues rather than by food cost. The discussion of this type of ration control in Section IV pointed out that it is used in certain "single pay" systems but concluded that it is not currently attractive for adoption within DoD.

The second approach defines the various foods to which an individual is entitled on a daily basis. The Navy Ration Law provides this type of standard. Under this approach the allowed weight of food of a particular type (e.g., vegetables) is expressed as a function of the form or preservation method, such as fresh, canned, frozen, or dehydrated. For example, the Navy Ration Law covers the fruit entitlement as follows:

> "Four ounces of dried fruit or ten ounces of canned fruit or six ounces of preserved fruit or sixteen ounces of fresh fruit or six ounces of canned fruit or vegetable juices, or one ounce of powdered fruit juices, or six-tenths of an ounce of concentrated fruit juices."

It is not required that enlisted members eat the listed quantities of food nor do the quantities represent maximum actual daily food allowances as they do in the case of the first alternative. In this instance the food standard (ration entitlement) is used to compute a cost standard which becomes the system control. The difficulty in arriving at the ration cost is that the entitlement for several food groups is stated in such a way (see the fruit entitlement above) that there is no clearly defined method for costing it. As a result, it is necessary to translate the statutory food standard into a more specific food list which can be readily costed using current food prices. In the case of the current

DoD ration cost system the specific food list is, of course, the food cost index. The fact that the current system has been functional for many years indicates that a statutory feeding standard of this type (i.e., such as found in the NRL) can be made to work.

The third approach listed above would involve determining a fair, defensible cost for the basic daily food allowance and writing that monetary feeding standard into the ration law. Because of the fluctuating prices of food, it would be necessary to include the date for which the cost reference was applicable. Then to ensure a constant level of feeding on a continuing basis, a FCI would be designed which, based on DPSC prices on the indicated date, would yield the ration cost indicated in the law. Since it is regarded as a representative ration, the FCI would also be consistent with nutritional standards and reflect food preference considerations. Once designed, this FCI would be costed periodically to yield the new BDFA value. Thus, the "cost-date" standard documented in the law would remain there as a reference point, but the actual ration cost would vary in the same fashion it does now. This alternative approach to a statutory feeding standard is judged to be feasible and acceptable in terms of the URCS requirements indicated in Section III.

The fourth listed option reflects in a more direct way the fact that ideally any feeding standard should give explicit consideration to cost, nutrition, and preference factors. One approach would be to apply prescribed nutritional standards and to set a desired (minimum) preference value for a cyclic menu and then develop a least cost cyclic menu which meets these two requirements. The menu would then be recapitulated, and the list of foods in the recap would become the basis for the FCI. In this approach the feeding standard consists of the prescribed nutritional and preference values. A related concept would be to state the feeding standard in terms of the nutritional standards and a selected ration cost value. In this case the cyclic menu would be designed for maximum preference within these constraints, and the recap would again be the basis for the FCI. The third and fourth options are similar in their attention to cost, preference, and nutrition. A basic difference in the two alternatives is that the fourth option is oriented to optimization, that is, to a highest preference or least cost solution. Further, this optimization can be sought every time the FCI solution (i.e., the reference cyclic menu) is determined. In the third option the true optimization of preference, while desirable, is not a realistic objective; and it is doubtful whether the FCI would be modified as frequently under this approach.

### Types of Ration Law

The major alternatives for a ration law for the URCS involve using either the NRL or developing a new URL which incorporates one of the above three preferred methods for expressing a statutory feeding standard —— that is, either of the second, third or fourth options. Thus, the alternative laws are:

1. Retain the NRL in its present form.

2. Revise the NRL to correct as many of its deficiencies as possible.

3. Develop a URL based on inclusion of a feeding standard expressed in terms of a list of foods representing the ration entitlement.

4. Develop a URL in which the feeding standard is a specific cost-date reference.

5. Develop a URL based on a feeding standard expressed in terms of nutrition-preference or nutrition-cost constraints and involving use of an optimized reference menu.

Each of these alternatives will now be discussed.

**The Present NRL.** The current law has served the Navy Department satisfactorily for over 40 years, but as the discussion in Section II indicates, it is now in need of improvement. This need has been felt by food service management in the Offices of Secretary of Defense and in the individual Military Departments for some time. In fact, it has been the perceived need to replace the present law with a Uniform Ration Law that has led to the conclusion that a Uniform Ration Cost System should be developed. Such a URCS would not only encompass the URL but also other elements of the system as well. The concept of a modernized URCS has in turn led to the requirement for this program.

Without further discussion it may be stated that this study has concluded that the present NRL is not acceptable for a modernized URCS. However, even though the NRL is not most appropriate for future use, its current value merits attention. In particular its use is of interest in the period during which the services achieve concurrence in the form of a URL, the Offices of the Secretary of Defense approve and forward the new legislation, and the Congress considers and acts on the proposed law. While it is hoped that consideration of a new law can be expedited upon issuance of the reports of this program, it is recognized that the review and approval process may take a significant amount of time. It is therefore recommended that as a first step in the improvement of the current ration cost system, a new FCI should be immediately developed consistent with the articles of the NRL. Since the index is a more active functional instrument than the law, modification of the index would represent a step forward during this period. The nature of this modification will be discussed later in this section under "Food Cost Index".

**Revised NRL.** Although it is apparent that the NRL can be modified to make it more effective, this alternative is rejected because if the Congress is to be approached for legislative action, there are ample reasons to recommend a URL rather than a reworked NRL. This is to say that a single, uniform law is much preferred for the Department of Defense rather than for the individual services to continue to maintain and modify their own ration laws.

**URL Containing a Food List Feeding Standard.** This alternative would retain the general format of the NRL. That is, the feeding standard would be provided in the URL in the form of a list of types and quantities of foods expressing the ration entitlement. In achieving this objective the NRL food list would be modified in line with the comments expressed in Section II, and other deficiencies pointed out in that section would also be addressed in framing the NRL. This approach is capable of achievement in the intermediate term, and therefore it is regarded as a feasible alternative.

**URL Containing a Cost-Date Feeding Standard.** The ration law in this case would no longer contain a statement of the ration entitlement in terms of food types and quantities. Rather, the feeding standard would be expressed, as previously stated, in terms of a specific cost of the ration as of a stated date. The law would require that a FCI be developed consistent with the cost standard and that the FCI provide a list of foods which satisfy nutritional standards and provide high consumer acceptance (preference). Once designed, the FCI would operate essentially as it does now. Therefore, the most noticable changes would be in the format of the ration law and in its relationship to the index. In the judgment of the URCS study team, this approach to the URL would work satisfactorily and could be implemented in the intermediate term.

**URL Based on Cost-Preference-Nutrition Optimization.** As expressed previously, the URL in this case would specify constraints that the FCI must meet in two of the three variables. The FCI would then be optimized with respect to the third variable. For example, the FCI would be designed to meet DoD nutritional standards and a specified food preference value (i.e., an average meal preference value for an entire menu cycle). The solution would then be optimized with respect to cost; that is, it would represent the least cost solution that satisfies the nutrition and preference constraints. Alternatively, an optimized FCI with respect to perference (i.e., highest preference) could be developed consistent with meeting nutritional standards and a selected cost constraint. In a practical sense computer procedures are required to achieve a truly optimized reference menu because of the number of iterations that are required if the optimization is performed manually. Progress has been made toward such capabilities; for example, a computer solution can now provide the number of times entrees should be served during a menu cycle in order to optimize (maximize) the menu food preference rating, given specified cost and nutrition constraints. This solution is for a nonselective menu (e.g., one entree offered per meal). Additional research is required to bring this capability to the point where reference computer solutions can be realized for more demanding requirements, such as for selective menus and for complete meals in which the compatibility of all

courses must be considered. Therefore, this alternative for a ration law must be viewed as a longer term possibility pending the results of on-going research efforts.

## Ration Law Implementation

In summarizing the preceding, the following conclusions are reached relative to selecting the ration law for an improved ration cost system:

**Near Term.** During the period in which a URL is under consideration, the NRL will of course remain in effect. The ration cost system can be improved during this time by near term development of a FCI that is consistent with the NRL but more representative of current feeding patterns. This change can be made within DoD without Congressional action.

**Intermediate Term.** A new ration cost system encompassing a URL should be introduced as soon as DoD can reach a coordinated position on the law and Congress can act on it. This analysis has presented two basic approaches that can be taken in defining the structure of the law in this time frame. First, the URL could be designed in much the same way the NRL is — that is, with a list of food types and quantities that represent the ration entitlement and that constrain the composition of the FCI. Second, a URL could contain a feeding standard in the form of a cost-date reference without the specific food components of the ration being spelled out. Observations relative to the advantages and disadvantages of these two approaches (called "components standard" and "cost-date standard" for abbreviation purposes) are discussed below.

1. **Translation of URL into FCI.** First, it should be pointed out that both types of URL require a FCI. The issue to be decided is the procedure for deriving the FCI from the URL. If the URL were to be designed so as to be an improved NRL (i.e., provide a modernized ration entitlement statement) and the FCI were to be derived from the law as at present, a lack of agreement could be expected to arise relative to how that derivation should be effected. Further, the current situation which permits the value of the BDFA to vary widely as a function of which foods are listed in the FCI ration entitlement would still prevail. Therefore, as indicated in Section II of this report, it would be desireable in the interests of attaining common understanding and usage to specifically address the method to be applied in translating the law into the FCI. This method could be contained in the law, or it could be delegated to the Secretary of Defense and then recorded in appropriate DoD directives. It would be expected that the FCI would be designed consistent with the types and quantities of foods in the URL articles, a cost limit (at the time the FCI is first formulated), nutritional standards, and that the FCI food components would be generally proportionate to current food usage. This food usage is now available in a URCS study report.[5] Although such a procedure should provide

greater clarity as to the development and future revision of the FCI, it must be noted that the procedure itself would add a new element to the ration cost system and would necessarily become subject to future review and revision. Further, the procedure for deriving the FCI under the several preceding constraints and conditions is a reasonably complex analytical task if performed in a comprehensive fashion. The cost-date standard URL would provide a simpler transition into a new FCI since there would be no listed food groups in the law requiring conformance by the index. It is concluded that in this respect, the design of a FCI would be easier in the case of the cost-date standard. This observation would also be valid for subsequent FCI revisions.

2. **Inflexibility.** It was mentioned in the review of the NRL in Section II that a components standard ration law that indicates a specific ration entitlement can be interpreted to constrain food purchases to those foods listed in the articles and to preclude other types of foods. This is currently illustrated in the Navy's restriction on the use of margarine. It was concluded that this inflexibility problem should be avoided in a URCS if possible. In the case of a components standard URL, this is theoretically possible but difficult to achieve. One approach would be to phrase the articles in such a general way that they could not be interpreted to prohibit use of any acceptable food item in the FCI in the foreseeable future. A possible problem here is that if the articles are phrased very generally then their impact on controlling the contents of the FCI would be diminished. That is, a very "loose" URL food list might have relatively little effect on the actual content of the FCI and, consequently, on the level of feeding (BDFA value). Further, such a generalized phrasing is made difficult by the need to specify different quantities for each form (preservation method) of each major type of food listed. This problem was made evident earlier in this Section by citing the fruit products category in the NRL as an example. A different approach would be to design the best current list of specific food articles for the present time and then to review it periodically in the future and revise it as required to reflect changing food technology and usage patterns. While this has intuitive appeal, it has the disadvantage of having to go to the Congress for each desired change since the wording of a law (US Code) is involved. In view of the fact that the cost-date standard does not list food articles, that type of URL could permit inclusion in the FCI of any foods authorized[26] for issue to the military services. This would not only give great flexibility to the contents of the FCI but would also preclude any wording of the ration entitlement that would legally bar the serving of DoD authorized foods in armed forces dining halls. Thus, the cost-date standard should effectively eliminate the problem of the type reported by the interservice task group which reviewed the FCI in 1972; that problem was that the ration law allowances restricted both the FCI listing of desired convenience foods and the desired quantitative increases/decreases in other components.

[26] Federal Supply Catalog Stock List C8900-SL, FSC Group 89, Subsistence.

Another problem causing inflexibility in the current system is the listing of single items in the NRL articles--for example, "one and six-tenths ounces of butter." While this does not mean that dining halls must purchase or provide exactly that quantity per ration served, it does mean that the listing of that item in the FCI has to agree with the quantity in the law. As food utilization patterns change, the FCI listed quantity for that item often becomes unrepresentative of actual usage. Thus, a change in the wording of the law is required to correct the deficiency. This problem is less significant in the case of NRL articles which provide several options for a particular generic food group (note vegetables in Figure 3, for example). Therefore, to facilitate keeping the FCI current with known food usage, any law using a components standard format should seek to avoid single item articles. Based on the investigations of this study, it appears that this can be done without too much difficulty in all cases except possibly eggs. However, it is further noted that the problem can be totally eliminated by use of a cost-date standard law. In effect, the cost-date standard places the composition of the FCI in the most capable hands, the senior dieticians of the services, without the inflexibility imposed by a law with prescribed food allowances.

3. **Price Fluctuations.** Both the components standard and cost-date standard approaches incorporate the use of a FCI. This is consistent with the similar use of indexes (or ration scales) in virtually every ration cost system studied in other US and foreign military ration cost systems. The FCI would be costed periodically using current food prices to determine the monetary value of the basic daily food allowance. Thus, in both alternatives the ration would be protected against changes in food prices in the sense that a constant ration would be provided independent of whether prices were moving up or down.

4. **Conformance with Food Utilization.** Both the components standard and the cost-date standard approaches would theroetically permit designing a FCI that could be correlated with known DoD food utilization and preference patterns. However, a basic difference in the two approaches is that the components standard law would require very careful design whereas the cost-date standard law requires only the determination of the appropriate BDFA value. Since the components standard would also require consideration of the resulting ration cost in the design of the components list, this alternative represents a more demanding design problem. Perhaps even more significant is the fact that the entitlement list in the components standard approach inevitably becomes unrepresentative of food utilization over a period of time. When this occurs, either the Congress must be requested to change the law or, as has been the case for sometime, the services have to use a FCI which is out of line with actual food usage and preferences. Under this type of system the exception to the law becomes the rule. Conversely, the unusual flexibility afforded under the cost-date standard facilitates a timely response to changing food preferences and usage not afforded by the components standard approach. It may be well to ask why it is important for the FCI to reflect current food utilization (i.e., purchase) data. Basically what is involved in the ration cost system is the use of the

FCI with current food prices to generate a per person per day dollar allowance (BDFA), which in turn is used by the dining facility manager to purchase food. If the food being purchased typically differs from the food components in the FCI, then it is quite likely that the dollar allowance from the FCI computation is either too high or too low. Or, stated another way, the best way to ensure that the funds provided are consistent with the funds required to provide an acceptable menu is to have a FCI that accurately represents the actual food usage and preferences. An example of this type of problem is shown by the current higher DoD use of meat than is provided in the FCI (Table 1, Section II). In order to live within the BDFA value, it is necessary for dining facilities to use less of other foods listed in the FCI (e.g., fruits, vegetables) to offset the greater expenditures for meat.

5. **Nutritional Standards.** In the case of both URL alternatives it is important for the FCI to present a list of foods that meet nutritional standards. Therefore, in a components standard type of law, the articles of the law must also be nutritionally well-balanced because of their direct impact on the composition of the FCI. Since the cost-date standard type of law does not contain a food list, it does not require the same attention to nutritional considerations and is, therefore, easier to design and keep current. Nutritional requirements in this case are applied by DoD in the design of the associated FCI.

6. **Structure, Terminology and Contents of the Ration Entitlement Statement.** The Navy Ration Law currently should be improved in these respects (see discussion in Section II), and any law containing a list of food components will require these types of changes from time to time. The need to make such changes no longer exists in the case of a law which uses a cost-date standard.

7. **Standard of Feeding.** The desirability of approximately equating the military level of feeding to that of comparable organizations in the U.S. civilian sector has been introduced in Section V. The URCS level of feeding study concluded that the single most efficient figure of merit on which to base such an equivalence is food cost. This concept is consistent with the customary use of costs as a control measure in most commercial and governmental activities. It is concluded that it is easier and more direct to achieve a desired level of feeding and to implement a particular ration cost in the case of a cost-date standard law than for the components standard alternative.

8. **Protection of the Ration Entitlement.** All persons involved in the management of food service in the military departments are justificably concerned about protecting the value of the ration from food price changes and administrative actions that would serve to lower the level of feeding. The traditional view taken is that this should be achieved by the listing of food components in the law. As was indicated in Section II, for a number of years this approach did result in the Navy feeding a higher cost ration than that provided by the other services not operating under the NRL. Nonetheless,

it has been pointed out that because of the lack of a firm and legally supported method for converting the NRL into the FCI, the actual protection provided by the law is really one of accommodation between functional and fiscal authorities at the service and OASD levels. For example, it was previously pointed out that in mid 1974 the BDFA could potentially vary between $1.20 and $5.37 (at a time when it was actually $2.24) because various FCI's could be designed that would in fact provide the requisite quantities of foods of each generic type (e.g., meat) listed in Section 6082 of the NRL. Thus, the protection afforded by the law results not so much from a clear, irrefutable application of Section 6082 as it does from negotiation and from the common sense and good judgment of all offices concerned with ration administration. This has lead to the further observation that in view of the fact that the NRL actually operates indirectly to provide a cost control (rather than a control which requires the feeding of specific quantities of various types of foods), either of two provisions should be introduced in a new law to protect the value of the ration: 1) the law should be changed to provide a cost standard directly and that standard could be adjusted periodically to reflect the changing prices of food, or 2) if a food components list were to be retained in the law, the procedure for translating it into a FCI should be stated specifically and deterministically. While either of these approaches would yield a higher level of protection that the current NRL does, the aforementioned complexities of designing and applying the food components approach suggest that the cost-date standard is more direct and easier to apply in protecting the ration value. So far as can be determined, the protection it would afford would be at least as positive as that provided by a new, more rigidly defined components standard alternative, and probably more so.

9. **Overall.** It is concluded that the preferred and recommended form for the URL is one which specifies the ration entitlement in terms of the monetary value of the BDFA as of a specific date (i.e., a cost-date standard). The URL would further require that a FCI be designed to the ration cost. The FCI would contain foods which satisfy The Surgeons General's nutritional standards and which represent high consumer acceptance. The FCI would then be costed periodically using current DPSC prices (and local prices where suitable) to yield the current value of the BDFA. The summary reasons for preferring the cost-date standard alternative over a component standard URL are as follows:

– The components standard approach imposes problems in the design and future revision of the URCS, particularly the FCI. If the standard were stated very specifically in terms of types and quantities of foods in order to provide a reasonable protection for the level of feeding (BDFA value), it would create inflexibility in the sense that the Secretary of Defense and the services would have difficulty in keeping the system current with changing food technology, food preferences, and other factors. On the other hand, if the component foods and quantities were stated in a very general fashion to provide increased flexibility in meeting consumer and other requirements, the law would provide only limited protection to the level of feeding.

– In a technical sense the cost-date standard is simpler and easier to apply, including consideration of nutritional standards, changing food utilization and preferences, maintaining comparability with appropriate civilian feeding standards, and in the structure and phrasing of the URL.

– In essence, the cost-date standard alternative would provide major overall advantages in that this type of ration law would give strong protection to the level of feeding while simultaneously delegating maximum flexibility to DoD to meet actual consumer and service requirements.

**Longer Term.** The above recommended URL is one that could be implemented within a reasonably short period of time. It is anticipated that this law should serve well because of its simplicity at the food service top management level and because its effect would hardly be noticeable at the operating level. Assuming that this is so, the next question is whether it is the best approach that can be developed for the longer term. The URCS study team has concluded that an approach that is similar to the cost-date standard URL but that incorporates optimization control (Section IV) would ultimately lead to a more effective ration control system.

The above proposed URL results in a FCI designed to a ration cost reference and further designed to meet nutritional requirements and to include foods which enable a highly preferred menu to be served. Thus, the development of the FCI from the URL involves consideration of cost, nutrition and food preference, three criteria which were introduced in Section III. Cost, as indicated above, is a specific design constraint, and therefore the cost of the FCI will equal the cost standard in the law at the time the FCI is designed and at any time the URL cost-date standard is changed. Under this approach, food preference is not an independent design constraint, but rather high preference is a goal in the FCI design effort. As will be pointed out later in this section, preference can be considered in either of two ways. First, the components of the FCI can be selected commensurate with DoD food utilization data; that is, the food items listed in the index are chosen on the basis of the most utilized foods, and their indicated quantities (or issue factors) are proportionate to their actual usage. Or, second, a reference menu is designed and analyzed. In this case competent menu planners design the high preference menu within the allowed cost. Preference is measured in terms of hedonic values (1 to 9 scale). Once the menu is designed (typically a 42 day cyclic menu is prepared), its recipes are recapitulated into their basic food ingredients. The FCI is then constructed using the menu recapitulation list in the same fashion as the previously mentioned food utilization data. While computer methods have been developed to assist in both of these approaches, the present state of the art does not permit formulation of a FCI that is optimized with respect to preference. Similarly, the nutritional content of the FCI (or of the reference menu from which it is developed) is not designed directly to prescribed daily dietary allowances (DDA). Rather, the analysis involves only analyzing the nutrition in the FCI to ensure that minimum nutritional requirements are met; typically

the analysis indicates that the requirements are exceeded. In view of the increasing knowledge of and interest in nutrition, the capability to design the FCI (and the associated menu) more specifically to desired nutrient levels can be developed if considered desirable by the URCS Committee. Such design would, however, be dependent on better data establishing the relationship between nutrition as determined by recipe analysis and actual "as consumed" nutrition.

The fundamental premise of the optimization control method is that the best basis for the FCI is a representative cyclic menu which is optimized with respect to nutrition, preference, and cost. Following construction of the menu, it is recapitulated into its basic foods. At that point the FCI can be designed either by converting the recap into a lesser amount (say 50) of food components that are equivalent in cost to the total list or by costing the entire recap list. Since that list may be composed of several hundred items, the total cost approach is not likely to be suitable unless a computer is used. The reference menu may be designed to: 1) maximize preference subject to selected cost and nutrition levels, or 2) minimize cost subject to preference and nutrition levels. These approaches are discussed and illustrated diagramatically in Section IV.

The first of these constraints would be consistent with the URL cost-date standard proposed for the intermediate term and could be applied in support of that approach. Over the longer term the second constraint may prove to be preferable. Under this approach the applicable nutritional standards and the desired preference level (hedonic scale) would be specified in the law and would be the constraints placed on the reference menu design. Subject to satisfying these requirements, a least cost menu would be the output.

The special features of the optimization control approach may be summarized as follows:

– the food list from which the FCI is developed is the recapitulation of an idealized menu for the selected constraints. Food lists derived from food utilization data or from non-optimized reference menus do not have this desirable feature.

– the FCI becomes a dynamic instrument in that it is no longer "locked in" to the same identical food types and quantities. This is in contrast to the current ration cost system and the proposed intermediate term URCS in which the FCI is much more static. That is, historically it can be seen that under these types of systems there is little likelihood that the FCI will change very often or very significantly. As a result, the FCI has been slow to reflect shifts in the fundamental preference or cost relationships between the listed components. This would not be true of a FCI in the optimized approach since the concept here is that the reference menu (hence its recapitulation and the resultant FCI) may change frequently as the relative preferences and costs of the recipes vary.

The protection of the ration in this longer term approach would lie in the constraints that are specified in the ration law. For example, if the law contained the cost and nutrition constraints, the FCI would be based on a reference menu that provided maximum preference. On the other hand, if the law specified preference and nutrition constraints, the FCI and associated menu would be a least cost solution no matter what the actual ration cost was computed to be. Parenthetically, the least cost solution would not necessarily be a low cost solution. At any rate, the emphasis would be on the feeding requirements (constraints) rather than on continuity of a fixed FCI. This concept has innovative and logical features, but it is apparent that it represents a departure from current operating procedures and that it would require testing prior to future URCS decisions.

The preceding discussion has been directed to the various desirable characteristics that the ration law should exhibit and to the recommended forms that the law should take. Recommendations have focussed primarily on the form of a new Uniform Ration Law for use by the DoD. Additional recommendations pertain to the continued use of the NRL until such time as the URL is placed into effect and to a more comprehensive type of URL that represents a long term goal but that requires additional research and development before it can become a reality. In view of the close functional relationship between the law and the index, each form of the ration law that is recommended has a direct impact on the nature of the FCI that is used in conjunction with it. For that reason the discussion will now turn to the FCI.

## THE FOOD COST INDEX

The major purpose of the FCI is to enable a constant level of feeding to be maintained in an environment in which the prices of food fluctuate. In a secondary sense the FCI provides a guideline relative to representative types and quantities of foods for military feeding.

In the design of a FCI, two types of choices must be made. First, the food items to be included in the index must be selected. These items must be clearly identified, for example by stock numbers. Second, the issue factors for each item must be determined. Issue factors are normally expressed in pounds per ration or per 100 rations, but some other unit of measure may be used, such as pints, quarts, or number (e.g., each or dozen).*

### Major Types of FCI Alternatives

Two general types of FCI have been considered. One approach has considered the feasibility of using the nationally known Bureau of Labor Statistics price change indexes — that is, either the Consumer Price Index (CPI) or the Wholesale Price Index (WPI). The alternative type of FCI is one that is designed especially for use within the DoD. This FCI would be similar in concept and form to the FCI currently in use.

*Or metric units when adopted.

Food is one of the five major groups within the CPI. The food group in turn is divided into "food at home", containing 5 subgroups and 264 items, and "food away from home", containing 2 subgroups and 3 items. A reasonably complex weighting, sampling, and pricing procedure is used in determing the quantitative value of the CPI and its component groups. A FCI concept based on use of the CPI would involve first setting a reasonable cost (BDFA) for the military ration and then periodically adjusting that ration cost directly in line with the percentage change in the CPI food group. Thus the increase or decrease in the BDFA value would be proportionate to the price movement in the CPI food group. This approach could eliminate the need for the BDFA computation currently carried out at military installations. Alternatively, if the WPI (rather than CPI) were to be applied in a similar fashion for the purpose of periodically adjusting the BDFA, some combination of two of its major commodity groups "farm products" and "processed foods", would be used. However, since these groups include certain subgroups, such as "manufactured animal feeds", that are not directly applicable, a modification of the WPI would be in order if it were to be seriously considered for this purpose. Similarly the "food away from home" subgroup of the CPI food group would not be appropriate for use in the computation of the BDFA, which pertains to the purchase of basic food items and does not include food service labor costs.

These considerations represent problems in the utilization of the CPI or WPI. However, a more significant factor is the question of their suitability for the DoD. The food items that are chosen for these indexes and their weights (or relative importances), which are comparable to the times and pound allocations in the FCI, are based on national usage. In the case of the CPI this usage is as of 1963. It is apparent from the fact that the weighting factors in the CPI, WPI and FCI are derived from different samples in different years that noticable differences can be expected. A brief examination indicates that this is indeed true. It is concluded that while it would be possible to use such national price indexes in a ration cost system, it is much more desirable to use an index which is specifically related to the types and quantities of foods that are representative of those used in military dining facilities and/or preferred by military consumers. Utilization and preference data that are relevant for this purpose have been collected and analyzed in the URCS study effort.[5,10] It is therefore, recommended that these data be actively applied and that a FCI which is specifically designed for feeding the military enlisted population continue to be used.

Attention will now be directed to the form that the FCI should take as a function of whether it is to be used in conjunction with a ration cost system previously described as 1) near term, 2) intermediate term, or 3) longer term.

## FCI: Near Term Improvements

It will be recalled that the recommended near term approach is to develop an improved FCI's within the constraints of the NRL. A number of alternative FCI for this purpose have been considered.[27] Two of these alternatives (one proposed by a Joint Service Task Group in February 1972 and the other by OASD (I&L) in April 1974) have been considered less acceptable, primarily because they were not able to take advantage of the DoD food utilization and preference data which became available starting in November 1974. The other alternatives do rely on the utilization and preference data, and these alternatives are distinguishable on the basis of how the FCI food components are selected to represent the articles of the NRL. The most attractive of these alternatives involve:

– choosing the FCI components from a list of food items which represent 75% by weight of the total quantity of food utilized on a per ration basis.

or

– selecting at least one FCI component for each of a number of representative food subgroups associated with each NRL article. A subgroup structure developed during this study is shown in Table 15. As an example of the use of this structure, the fresh vegetables in NRL article 3 would be represented in the FCI by one or more food items for each of the subgroups entitled: yellow, dark green, leafy, and other vegetables.

One possible difficulty with the first alternative is that because of the limited number of food items included in the top 75% of total utilization, there may be no foods to represent certain NRL articles. The food subgroup approach would not experience this problem since for each selected subgroup it could incorporate into the FCI the food item with the highest usage per ration, independent of whether that item was highly used in an absolute sense. Further, in the case of the food subgroup alternative it is easier to adjust the FCI to a desired level of feeding (i.e., monetary value of the ration) while still remaining consistent with the specific food quantities indicated in the NRL articles. If the "first cut" BDFA is less than the desired level of feeding cost, this adjustment is accomplished within the subgroup structure by selectively substituting more expensive, higher preference items for the highest usage items. The food subgroup alternative offers greater flexibility in general. For example, this alternative permits using all the foods in the top 75% while the reverse is not true. For these reasons it is concluded that a near term improved FCI that is consistent with the NRL is best achieved by using the food subgroup methodology. An example of a FCI derived using the subgroup approach is provided in Table 16. It is emphasized that this FCI could vary as a function of

[27] Brandler, P., "The Development of Alternative Food Cost Indexes", US Army Natick Development Center, Technical Report 75-67-OR/SA.

## TABLE 15

### Subgroups Used in Developing an FCI Based on the NRL

Beef, Frozen

Veal and Lamb, Frozen

Pork, Frozen

Poultry and Rabbit, Frozen

Fish, Frozen

Shellfish, Frozen

Sausages, Frozen

Smoked and Salted Meats and Cold Cuts

Canned and Dehydrated Meats

Bread, Rolls and Crackers

Flour and Mixes

Dry and Dehydrated Vegetables

Dry Legumes, Nuts and Nut Butter

Tomatoes, Canned

Legumes, Canned

Yellow Vegetables and Potatoes, Canned

Leafy Vegetables, Dark-Green Vegetables, Other Vegetables, Canned

Potatoes, Fresh

Tomatoes, Fresh

Yellow Vegetables, Fresh

Dark-Green Vegetables, Fresh

Leafy Vegetables, Fresh

## TABLE 15 (Cont'd)

### Subgroups Used in Developing and FCI Based on the NRL

Other Vegetables, Fresh

Potatoes, Frozen

Dark-Green Vegetables, Frozen

Yellow Vegetables, Frozen

Other Vegetables, Frozen

Legumes, Frozen

Dried, Canned and Preserved Fruit

Citrus Fruit, Fresh

Other Fruit, Fresh

Fruit, Frozen

Canned Juice

Frozen Juice and Instant Juice

Coffee, Cocoa and Tea

Milk

Butter

Pasta

Cereal

Rice

Cheese

Eggs

Salad Oil and Dressings

Other Fats and Oils

Sugar

## TABLE 16

## NAVY RATION LAW TYPE FCI BASED ON FOOD SUBGROUPS

| Component | Unit | Quantity per Hundred Rations |
|---|---|---|
| Beef, Ground, Frozen | Pound | 20.049 |
| Beef, Grill Steak, Boneless, Frozen | Pound | 6.888 |
| Beef, Oven Roast, Boneless, Frozen | Pound | 8.169 |
| Veal, Slices, Boned, Frozen | Pound | 3.010 |
| Pork, Spareribs, Frozen | Pound | 5.518 |
| Pork, Ham, Boneless, Frozen | Pound | 3.850 |
| Chicken, Cut-up, Frozen | Pound | 12.725 |
| Cod, Portions, Frozen | Pound | 2.336 |
| Shrimp, Raw, Breaded, Frozen | Pound | 2.362 |
| Frankfurters, Frozen | Pound | 4.757 |
| Bacon, Sliced, Frozen | Pound | 8.050 |
| Bologna, Frozen | Pound | 1.538 |
| Ham, Canned | Pound | 5.856 |
| Bread, White, Fresh | Pound | 42.488 |
| Flour, Wheat | Pound | 32.220 |
| Potatoes, White, Instant | Pound | 3.045 |
| Beans, White, Dry | Pound | 1.263 |
| Tomatoes, Canned | Pound | 6.938 |
| Beans, White, Canned | Pound | 8.588 |

TABLE 16 (Cont'd)

NAVY RATION LAW TYPE FCI BASED ON FOOD SUBGROUPS

| Component | Unit | Quantity per Hundred Rations |
|---|---|---|
| Corn, Whole Grain, Canned | Pound | 4.125 |
| Beets, Canned | Pound | 3.038 |
| Potatoes, White, Fresh | Pound | 70.330 |
| Tomatoes, Fresh | Pound | 11.406 |
| Peppers, Sweet, Fresh | Pound | 4.756 |
| Carrots, Fresh | Pound | 9.600 |
| Onions, Dry | Pound | 23.731 |
| Lettuce | Pound | 33.069 |
| Potatoes, White, Frozen | Pound | 13.563 |
| Broccoli, Frozen | Pound | 4.400 |
| Corn, Whole Grain, Frozen | Pound | 4.381 |
| Vegetables, Mixed, Frozen | Pound | 7.556 |
| Beans, Green, Frozen | Pound | 6.200 |
| Peaches, Canned | Pound | 17.638 |
| Apples, Fresh | Pound | 27.856 |
| Oranges, Fresh | Pound | 14.425 |
| Strawberries, Frozen | Pound | 4.328 |
| Juice, Pineapple, Canned | Pound | 7.556 |

TABLE 16 (Cont'd)

NAVY RATION LAW TYPE FCI BASED ON FOOD SUBGROUPS

| Component | Unit | Quantity per Hundred Rations |
|---|---|---|
| Juice, Orange, Frozen | Pound | .689 |
| Coffee, Roasted | Pound | 12.500 |
| Milk, White, Fresh | Pint | 200.000 * |
| Butter | Pound | 10.000 |
| Spaghetti | Pound | 3.944 |
| Cereal, Prepared, Individual | Pound | 3.806 |
| Rice | Pound | 2.250 |
| Cheese, Cottage | Pound | 3.125 |
| Eggs, Shell | Dozen | 10.000 |
| Shortening Compound | Pound | 10.000 |
| Salad Dressing | Pound | 10.000 |
| Sugar, Granulated | Pound | 31.250 |
| Condiments: Add 1.5% of Subtotal | | |

*Consistent with DOD Appropriation

the number and types of subgroups selected for use and the value of the BDFA (i.e., level of feeding) to which it is designed. The judgment of professional dieticians is an important element in the design of such a FCI, particularly in matters such as the subgroup structure and reviewing the FCI solution.

### FCI For A Uniform Ration Cost System

Since the improvement of the FCI under the NRL is regarded as only a temporary problem until a URL is adopted, the greatest emphasis has been placed on designing a FCI that will become an integral operating element of a new URCS. As previously stated, the system concept is that this FCI should:

- provide a BDFA value equal to the ration cost stated in the URL for the specified date, using federal price list costs for that same date.
- define a ration that is consistent with The Surgeons General's nutritional requirements. (See reference 11).
- define a ration that can provide a high level of consumer acceptance.
- potentially include any food item authorized for DoD use.

The basic data for effectively introducing consumer acceptance into the FCI derivation process is either: 1) DoD food utilization data that was obtained in the previously mentioned URCS special study of military food usage, or 2) recapitulation of a reference cyclic menu that has been designed using armed forces food preference data. In the following discussion the application of the food utilization data will be first considered.

Four types of decisions must be made in selecting food items and their issue factors for a FCI based on a cost-date standard URL. These decisions include:

1. the types of food groups that are to be represented by one or more food items in the index.

2. the method for selecting food items for each identified food group; basically the choice is between selection on the basis of either usage (weight) per ration or expenditure (cost) per ration.

3. within each of the preceding choices, items can be chosen on the basis of a specific number of items (e.g. two) for each food group or the selections can be limited to those items included within the top 75% of either total usage or total expenditure.

4. the method for determining issue factors for the selected food items. The computation of issue factors is affected by the constraints placed on the FCI. These constraints may include: 1) total usage in lbs/ration, 2) total expenditure in cost/ration, and 3) maintaining the relative proportions of either usage or expenditure between items in each food group.

The selection of major food groups, the first item above, can be done in a number of ways. The groups chosen by the URCS study team are shown in Table 17. These groups have been selected specifically for this purpose, just as the previously indicated food subgroups (Table 15) were designed specially to go with the 14 articles of the NRL.

Next, the alternatives for developing the FCI based on selecting two items for each major food group have been examined (in a few exceptions, such as eggs, only one item per group is used). First, the particular items are selected from the DoD food utilization data (NDC TR-75-65-OR/SA) based on either greatest usage or greatest cost within the group; normally greatest usage is the criterion chosen. Mathematical solutions for the issue factors that pertain for these items can be obtained by imposing any two of the three constraints; to do so, three combinations of the constraints are possible: cost and proportion, usage and proportion, and usage and cost. FCI solutions for each of these pairs of constraints have been achieved. If it is desired to consider all three constraints, the mathematical solution becomes overdetermined since there are then three equations in two unknowns (the unknowns being the issue factors for the two items selected within the group). In this three constraint case, two approaches to solving for the issue factors have been pursued: 1) average the exact solutions for the cost/proportion and usage/proportion constrained solutions, or 2) utilize a least squares best fit in the absence of an exact solution.

The mathematical expressions for all of the computational choices mentioned above are derived in the previously referenced report, "The Development of Alternative Food Cost Indexes," and the reader is referred to that technical report for details.

Examples of the FCI generated by the five preceding alternative methods are illustrated in Table 18. It will be noted that in the case of the weighted least squares approach, it is possible to apply the perceived relative importance of the three constraint factors by using weighted factors. In the example in Table 18 the cost relationship was weighted 0.5, usage 0.3, and proportion 0.2. This indicates that the greatest emphasis was placed on maintaining cost distribution between food groups and the least emphasis on maintaining the item proportions within each group. The bases for the five alternatives, all of which use the indicated food groups (Table 17) and two food items per group selected on the

## TABLE 17

### Major Groups Utilized in Developing URL Type FCI's

Beef, Cuts, Frozen

Remainder of Beef

Veal, Lamb, and Rabbit

Pork, Diced and Sliced, Frozen

Remainder of Pork and Sausages and Cold Cuts

Poultry

Fish and Shellfish

Eggs

Butter

Milk and Milk Drinks

Cream and Ice Cream and Cheese

Tea, Coffee and Cocoa

Juices and Soft Drinks

Potatoes

Remainder of Vegetables, Fresh

Remainder of Vegetables, Frozen

Remainder of Vegetables, Canned

Legumes and Nuts and Remainder of Vegetables, Dehydrated

Bread, Rolls, and Biscuits and Other Baked Goods

Pasta and Cereals and Cereal Pastes and Rice and Barley

TABLE 17 (cont'd)

**Major Groups Utilized in Developing URL Type FCI'S**

Flour and Mixes

Fruits, Fresh and Frozen

Fruits, Canned and Dehydrated

Margarine

Salad Oil and Dressings and Other Fats and Oils

Sugar and Syrup, Honey, and Molasses

Jam and Jellies and Candy and Puddings and Pie Fillings, etc.

Miscellaneous Items and Condiments

## TABLE 18

### FCI's Based on DOD Expenditure & Utilization Data

### Issue Factor (lbs./100 rations)

| Component | Usage/ Proportion | Cost/ Proportion | Average Usage/Prop. Cost/Prop. | Weighted Least Sq. Cost (.5) Usage (.3) Prop. (.2) | Usage/ Cost | Usage/Cost Adjusted to Level of Feeding |
|---|---|---|---|---|---|---|
| Bacon, Sliced | 6.902 | 7.043 | 6.972 | 6.665 | 6.660 | 5.938 |
| Beef, Grill Steak | 9.238 | 7.735 | 8.487 | 9.238 | 7.500 | 9.199 |
| Beef, Oven Roast | 10.953 | 9.171 | 10.062 | 10.953 | 12.691 | 13.992 |
| Beef, Ground | 14.205 | 16.060 | 15.133 | 11.878 | 15.133 | 5.672 |
| Beef, Patties | 6.295 | 7.117 | 6.706 | 9.874 | 6.706 | 13.763 |
| Ham, Canned | 15.147 | 15.023 | 15.085 | 15.387 | 15.085 | 11.479 |
| Pork Slices, Boneless | 2.104 | 2.147 | 2.126 | 2.343 | 2.346 | 3.068 |
| Pork Spareribs | 8.609 | 8.539 | 8.574 | 8.256 | 8.574 | 13.024 |
| Veal, Slices, Boneless | 2.826 | 2.852 | 2.839 | 2.871 | 2.871 | 3.169 |
| Veal, Ground | .725 | .731 | .728 | .680 | .680 | .383 |
| Chicken, Cut-up | 11.668 | 12.439 | 12.053 | 10.342 | 10.246 | 8.870 |
| Turkey, Raw, Boneless | 2.999 | 3.197 | 3.098 | 4.346 | 4.421 | 5.796 |

TABLE 18

FCI's Based on DOD Expenditure & Utilization Data

Issue Factor (lbs./100 rations)
(Continued)

| Component | Usage/ Proportion | Cost/ Proportion | Average Usage/Prop. Cost/Prop. | Weighted Least Sq. Cost (.5) Usage (.3) Prop. (.2) | Usage/ Cost | Usage/Cost Adjusted to Level of Feeding |
|---|---|---|---|---|---|---|
| Fish Portions, Cod | 2.451 | 2.763 | 2.607 | 2.607 | 2.607 | 2.690 |
| Shrimp, Raw, Breaded | 3.842 | 4.331 | 4.087 | 4.087 | 4.087 | 4.217 |
| Butter | 6.766 | 6.766 | 6.766 | 6.766 | 6.766 | 7.172 |
| Margarine | 1.527 | 1.527 | 1.527 | 1.527 | 1.527 | 1.619 |
| Cheese, American | 2.453 | 3.037 | 2.745 | 3.506 | 3.508 | 3.837 |
| Cheese, Cottage | 3.395 | 4.204 | 3.799 | 2.342 | 2.340 | 2.011 |
| Eggs, Shell | 22.024 | 22.819 | 22.422 | 22.422 | 22.422 | 24.189 |
| Ice Cream | 8.561 | 8.285 | 8.423 | 8.423 | 8.423 | 8.782 |
| Milk, Chocolate | 30.426 | 30.527 | 30.476 | 30.429 | 47.542 | 32.358 |
| Milk | 159.152 | 159.681 | 159.417 | 159.167 | 142.036 | 169.262 |
| Apples, Fresh | 14.141 | 18.160 | 16.151 | 22.629 | 16.151 | 16.695 |

## TABLE 18

### FCI's Based on DOD Expenditure & Utilization Data

### Issue Factor (lbs./100 rations) (Continued)

| Component | Usage/ Proportion | Cost/ Proportion | Average Usage/Prop. Cost/Prop. | Weighted Least Sq. Cost (.5) Usage (.3) Prop. (.2) | Usage/ Cost | Usage/Cost Adjusted to Level of Feeding |
|---|---|---|---|---|---|---|
| Oranges, Fresh | 14.651 | 18.815 | 16.733 | 6.377 | 16.733 | 17.297 |
| Lettuce, Fresh | 25.443 | 20.148 | 22.796 | 30.034 | 30.492 | 29.339 |
| Potatoes, White, Fresh | 36.405 | 44.987 | 40.696 | 35.002 | 16.315 | 9.996 |
| Tomatoes, Fresh | 12.700 | 10.057 | 11.379 | 8.063 | 7.651 | 8.804 |
| Corn, Whole, Grain, Frozen | 5.705 | 5.532 | 5.619 | 3.976 | 3.604 | 7.647 |
| Peas, Frozen | 4.788 | 4.566 | 4.677 | 3.611 | 3.582 | 5.068 |
| Potatoes, Fried, Frozen | 9.928 | 12.269 | 11.099 | 11.680 | 30.018 | 36.337 |
| Vegetables, Mixed, Frozen | 4.923 | 4.775 | 4.849 | 6.644 | 7.024 | 2.982 |
| Bread, White, Fresh | 30.221 | 31.291 | 30.756 | 30.676 | 38.548 | 32.733 |
| Rolls, Fresh | 8.841 | 9.154 | 8.998 | 8.503 | .514 | 6.687 |
| Shortening, Compound | 9.811 | 11.126 | 10.468 | 14.653 | 10.468 | 10.802 |
| Beans, White, Canned | 11.470 | 10.937 | 11.203 | 12.644 | 12.676 | 11.190 |
| Corn, Whole Grain, Canned | 2.480 | 3.144 | 2.812 | 8.338 | 9.941 | 12.059 |

## TABLE 18

### FCI's Based on DOD Expenditure & Utilization Data

### Issue Factor (lbs./100 rations) (Continued)

| Component | Usage/ Proportion | Cost/ Proportion | Average Usage/Prop. Cost/Prop. | Weighted Least Sq. Cost (.5) Usage (.3) Prop. (.2) | Usage/ Cost | Usage/Cost Adjusted to Level of Feeding |
|---|---|---|---|---|---|---|
| Juice, Pineapple, Canned | 8.356 | 14.269 | 11.312 | 22.209 | 11.312 | 11.740 |
| Peaches, Canned | 8.176 | 10.846 | 9.511 | 9.511 | 9.511 | 9.836 |
| Pineapple, Canned | 8.047 | 10.675 | 9.361 | 9.361 | 9.361 | 9.682 |
| Tomatoes, Canned | 13.214 | 16.755 | 14.985 | 7.400 | 5.753 | 3.635 |
| Cake Mix, Yellow | 4.900 | 5.585 | 5.242 | 7.064 | 8.249 | 9.888 |
| Flour, Wheat | 20.341 | 23.182 | 21.762 | 18.231 | 16.993 | 15.353 |
| Rice, Parboiled | 4.933 | 5.089 | 5.011 | 6.248 | 6.358 | 5.163 |
| Spaghetti | 3.115 | 3.213 | 3.164 | 1.804 | 1.690 | 3.260 |
| Sugar, Granulated | 14.646 | 14.641 | 14.644 | 14.640 | 14.607 | 16.555 |
| Cocoa | .124 | .120 | .122 | .574 | .583 | .125 |
| Coffee, Roasted | 4.291 | 4.166 | 4.228 | 3.839 | 3.831 | 4.353 |
| Beverage Base | 22.930 | 39.157 | 31.044 | 9.239 | 31.044 | 32.218 |

## TABLE 18

### FCI's Based on DOD Expenditure & Utilization Data

Issue Factor (lbs./100 rations)
(Continued)

| Component | Usage/ Proportion | Cost/ Proportion | Average Usage/Prop. Cost/Prop. | Weighted Least Sq. Cost (.5) Usage (.3) Prop. (.2) | Usage/ Cost | Usage/Cost Adjusted to Level of Feeding |
|---|---|---|---|---|---|---|
| Jam, Strawberry | 2.548 | 2.912 | 2.730 | 3.628 | 3.629 | 4.147 |
| Jelly, Apple | 2.944 | 3.364 | 3.154 | 1.865 | 1.864 | 1.345 |
| Salad Dressing | 4.630 | 5.250 | 4.940 | — | 4.940 | 5.097 |
| Syrup, Maple | 5.244 | 5.243 | 5.244 | 5.250 | 5.283 | 3.420 |

basis of greatest usage per ration within each group, are as follows:

- satisfy group usage and proportion constraints
- satisfy group cost and proportion constraints
- satisfy all three group constraints (usage, cost, proportion) by averaging the solutions for the usage/proportion and cost/proportion constraints
- satisfy all three constraints by a least squares best fit
- satisfy group usage and cost constraints

In addition, Table 18 presents a FCI adjusted to a particular level of feeding (i.e., BDFA value). This is achieved by adjusting the cost levels of the food groups so that their total exactly equals the desired level of feeding cost.

The preceding discussion has been concerned with an FCI generation approach which starts with the selection of two high usage food items within each food group and then preceeds to solve for the issue factors (quantities) for each item. An alternative to the two item per group selection discussed earlier under the various required decisions was to limit the FCI to food items found within the top 75% based on DoD total usage or total expenditure. Procedures for deriving the FCI on this basis for both usage and expenditure data are detailed in the above mentioned report, and examples of FCI are also provided.

It will be noted in the preceding that in selecting food items for the FCI, whether relying on two items per groups or on the top 75% only, it is necessary to make a judgment as to whether greatest utilization or greatest expenditure is the preferable criterion to apply. Although either is feasible, it is the opinion of this analysis that utilization data is the better approach. When expenditure data are used, an appreciable percentage of the items representing the greatest expenditures are items with high unit costs but only moderate usage. If these are employed in the FCI and allowed to assume issue factors consistent with the total utilization of the food group that they represent (or in the case of the NRL, the lbs/ration prescribed for the corresponding article), the resulting FCI provides a BDFA that is excessively high. This kind of problem is not experienced when utilization is used as the basis for selecting FCI components.

In summary, the preceding discussion leads to the following observations relative to the previously mentioned four types of decisions:

| DECISION | CONCLUSION |
|---|---|
| Food Groups To Be Represented in the FCI | Select a balanced sample of the types of foods used in DoD (Example provided). |
| Basis for Selecting Food Items to Represent Each Group | Use DoD food utilization data (lbs. per ration). |
| Method for Selecting Specific Food Items for Each Group | Select two items per group based on highest utilization within that group. |
| Method for Determining Issue Factors for Each Item | Utilize the weighted least squares method. |

The weighted least squares method not only considers the greatest number of factors (cost, usage, and proportion) but also offers two additional advantages: first, it permits different importance (weighting) to be placed on each of the three factors, and second, the solution minimizes the error in the necessarily approximate solution to n equations in n-1 unknowns.

While the preceding addresses the relative desirability of food utilization vs food expenditure data, it does not consider another alternative, the use of a reference menu for development of the FCI. As previously described, the concept for this method is to use military food preference data to prepare a cyclic menu which is high in consumer acceptance and which satisfies nutritional constraints. Through analysis of the constituent recipes, the menu is then recapitulated into its requisite ingredients and their respective per ration quantities, and the FCI is developed from this list. At the time of its design the composition of the FCI can be chosen so that its cost is equal to the desired level of feeding (BDFA). The menu recapitulation is indistinguishable from the DoD food utilization data; that is, it is a relatively long list of food items and their quantities. Like the utilization data, each item is displayed on a pounds per ration basis. As a result of this similarity, the methodology for deriving a FCI from DoD food utilization data or from a reference menu recap is equivalent, and the preceding methodology discussion therefore holds for the reference menu approach.

The use of preference data to design military menus is not a new concept since the Armed Forces Menu Service Committee has for many years made use of preference

information in developing the "42 Day Armed Forces Menu".[28] It is only the use of a high preference menu as a reference for FCI design that represents a new approach in ration cost system development. In this regard the use of DoD food preference data lends credibility to a DoD reference menu in an analogous fashion to the way DoD food utilization data makes the previously described methodology credible. The existence of the recently available preference data for all of DoD[10] makes possible the preparation of a reference menu which considers in a scientific way the preferences of all four services.

The issue, then, is whether utilization data or reference menus represent the preferred data base for FCI development. From the standpoint of developing a URCS which is "directly related to known consumer requirements" (see study objectives, Section I), reference menus offer particular advantages. By incorporating the latest information on basic food preferences obtained directly from service personnel, it increases the likelihood that the FCI meets their requirements. On the other hand, historical usage data is at best an indirect indicator of the consumers' wishes. While usage data is assumed to represent dining facility managers' views of what the consumer wants, it is the opinion of the authors that this premise is questionable. Extensive past observations[29,30] have indicated that many military food service activities operate for the convenience of the operator rather than the convenience of the consumer, resulting in low acceptance at the user level. Further, usage data can not help but reflect other extraneous influences to which military food service has sometimes been subject, such as vagaries in supply, inconsistent menu planning, wastage, equipment and staffing constraints, and limited professional dietetic supervision. This is not to say that historical usage data is of no value, but rather to suggest that preference data is more sensitive to consumer requirements and, in the future, more likely to be responsive to changes in those requirements. Further, the reference menu approach has intuitive as well as practicable appeal in view of the fact that a menu is a visible and tangible basis for an index, being more so than a list of foods that have little discernible association with menus. A reference menu can also be issued as an optional, guideline menu for dining facilities; such a menu represents a "best" menu that is consistent with Armed Forces Menu Standards and with the particular BDFA which derives from the menu recap. These considerations lead to the conclusion that a reference menu is the more attractive means of developing a FCI.

[28] Army Supply Bulletin SD 10-262, Navy Publication NAVSUP Pub 516, Air Force Manual AFM 146-3, and Marine Corps Publication MCD P10110.35A.

[29] Kiess, H.O., et. al., "Fort Lewis Dining Facilities Consumer Survey," US Army Natick Laboratories TR-72-44-PR.

[30] Branch, L.G., et. al., "A Consumer Evaluation of Air Force Food Service," US Army Natick Laboratories TR-75-22-FSL.

In order for the reference menu approach to be applied at this time, the menu would have to be prepared manually utilizing the talents of professional dieticians. Food preference criteria would be applied, generally by including only relatively high preference items of each category (entrees, vegetables, starches, etc.), and the menu would be adjusted so that the ration cost would be equal to the level of feeding (BDFA value). A reference menu has been prepared in this fashion in the URCS study. The features of this menu in comparison with the 42 Day Armed Forces Menu are as follows:

| Criteria | 42 Day Armed Forces Menu | URCS High Preference Menu |
|---|---|---|
| Cost per Ration | $2.25 | $2.29 |
| Preference (Hedonic) | 6.05 | 6.20 |
| Nutrition | >DDA* | >DDA* |
| No. of Recipes | 416 | 209 |

*Exceeds the Daily Dietary Allowances in all nutrient areas.

The BDFA at this time was $2.24. With a modest amount of effort, the menus could be adjusted so that costs are exactly $2.24.

This preliminary attempt at a reference menu indicates that a discernible gain in preference is possible if special attention is directed to this area. The fact that the 42-Day armed forces menu is rather high preference itself indicates that the menu is a reasonable example for future reference menu development activities. An interesting aspect of the URCS reference menu is the greatly reduced number of recipes; this has interesting potential implications in terms of military food supply and food service training.

Even though reference menus can be developed manually, various analytical aids that will facilitate the process are still under development. Generally this work is oriented to automating the methodology, but it is also concerned with issues such as whether a selective or non-selective preference menu should be developed, the specifics on how a cyclic menu should be analyzed for overall preference, and what computational rules (i.e., percent of customers assumed to take each type of item) should be used in recapping the menu.

As a result of these considerations, it is considered desirable to use DoD utilization data in the near term preparation of a FCI that is compatible with the NRL. In preparing a new FCI to be used in a new URCS it may, depending on the timing, be desirable

to use utilization data initially. However, it is recommended that the reference menu approach to FCI formulation be implemented as soon as practicable. The US Army Natick Development Center is prepared to assist in this effort and has developed special analytical techniques[31],[32] including associated computer programs, for this purpose.

One additional comment should be made about this approach. The recap of a reference menu provides, as previously indicated, a relatively long list of food items and the associated per ration quantities of each. Computer processing capabilities make it possible to cost this entire list to arrive at the BDFA value. Thus, in effect the recap would become the FCI. Alternatively the recap list could be reduced to a lesser number of items, for example about the length of the current FCI. While the cost of the entire recap and the abbreviated list could both be set equal to the desired level of feeding (BDFA value) at the time it is designed, it could not be expected that the short FCI would track exactly with the recapitulated reference menu cost over a period of time. At the outset of a URCS the use of a short FCI would appear to be advisable. However, it is recommended that entire reference menu costing at a central location be instituted for determining the BDFA value as soon as shown to be acceptable for service needs. Such a procedure should permit minor adjustments in the BDFA to accommodate the varying prices of certain perishable foods (e.g., bread, milk) that are typically purchased locally on a negotiated basis.

## A LONGER TERM FCI

The preceding discussion in this section has recommended use of the optimization control system as a longer term basis for the ration law. Under this approach the ration law would provide a set of constraints that would act as controls. The concept would be made operational through the development of an optimized reference menu that would be consistent with the stated constraints.

The reference menu that would be developed would then become the basis for the FCI in the same manner as described above for the intermediate term URCS. That is, the preferred FCI would simply be the recap of the reference menu and that recap would be completely costed by computer, using current DPSC food prices to yield the BDFA value. Thus, the optimized menu and central costing of the menu recap would yield the "best possible" BDFA solution considering the selected constraints and the food price, preference and nutrition information existing at the time. The continuing solution of the reference menu at selected time intervals would probably mean that menu and its

[31] Rogozenski, J.E., and Moskowitz, H.R., "A System for the Preference Evaluation of Cyclic Menus", US Army Natick Development Center, Technical Report 75-46-OR/SA.

[32] Rogozenski, J.E., "A Computer System for Menu Evaluation and Related Applications", US Army Natick Development Center, Technical Report 75-50-OR/SA.

recap, hence the FCI, would change fairly frequently. Thus, the FCI would become dynamic in character, promptly reflecting price and preference changes as they occur.

To fully implement this concept, the menu optimization solution must become a practical reality. A number of technical problems must be solved and computer algorithms developed before this approach to a URCS can be tested and subsequently adopted. Nonetheless, URCS sponsored research is continuing in this area, and progress toward the ultimate capability is encouraging.

## URCS REVIEW COMMITTEE

Mathematical models which have been adapted for computer solution have been developed for use in designing improved FCI's for the near term, the intermediate term and the longer term. Except in the case of the longer term, the recommended procedures have not only been formulated but have also been tested during this study. While confidence in these approaches is good, it must be emphasized that these models are only computational aids. At many steps in their utilization the sound judgment of dieticians and other food service professionals is required either in providing fundamental input (such as selecting the most appropriate food groups), in checking the menu solutions for overall suitability, or in adjusting issue factors so that a ration cost objective is realized.

In addition to interactions between study analysts and service professionals on the above technical matters, active continuing participation by military food service management in the application of the ration cost system should be ensured. It was pointed out in Section II that currently there is no requirement for scheduled review of the NRL, the FCI, or other parts of the ration cost system. In turn, Section III states that one of the requirements of a URCS is that it should be "reviewed on a periodic basis in order to provide timely modifications". It is therefore proposed that a URCS Committee be formed to meet this need. It is recommended that this be a standing committee operating under the DoD Food Planning Board. The committee should consist of representatives of each military service, The Surgeons General, and the Defense Supply Agency. It is also recommended that it include a Natick Development Center representative who can advise on the findings and recommendations of this study, provide technical assistance on the methodology for FCI computations, and make available the various types of relevant technical data, such as most recent food utilization and preference data. The committee should be authorized to obtain advisory services from other DoD organizations in areas such as food service operations, management, technology, nutrition, logistics, and finance.

The major functions envisioned for the URCS Committee are as follows:

1. Serve initially as the agency through which the services critique the recommendations of this report and reach a coordinated position on the structure and operation of a uniform ration cost system, including proposed legislation for a Uniform Ration Law and the design of an improved FCI.

2. Serve as the action agency for periodic review of the URCS and for recommending future modifications in the system, and

3. Provide advice to, and review the results of, future Natick Development Center research and development efforts in the URCS area.

The purpose of the periodic reviews conducted by this committee would be primarily to keep the URCS current with changing military requirements, consumer preferences, nutritional standards, US community feeding standards (in comparable organizations), and food technology. This work would undoubtedly focus on the composition of the FCI but would also be concerned with the less frequently required review of the URL and with other parts of the URCS (e.g., headcount, BAS). It is recommended that the FCI be reviewed annually and that at this review the need for changes in other parts of the URCS should also be considered. In view of the proposed role of the level of feeding analysis (Section V) in setting a reasonable standard of feeding for military enlisted members and the reflection of that analysis in the URL cost-date standard, it is recommended that a level of feeding analysis be performed about every four years under the direction of the URCS Committee.

Without intending to be fully comprehensive in this area, the following general guidelines are suggested for the operations of this committee:

1. It should periodically receive proposed changes to the FCI and other URCS elements from all interested sources, particularly the four military services.

2. After developing its own recommendations, it should submit such recommendations for comment and approval by the services, and, if relevant, The Surgeons General and the Defense Supply Agency. Recommendations should then be forwarded to the Offices of the Assistant Secretary of Defense (Installation and Logistics) for coordination and other action at the OSD level. Interested OASD offices would include, as appropriate, Manpower and Reserve Affairs, General Counsel, Health and Environment and the Comptroller.

3. Approval of matters not requiring legislative changes would be expected to reside, as now, at the Deputy Secretary of Defense level.

4. URCS operating instructions should be prepared by the committee and recorded in DoD Directive 1338.10, or in some similar directive.

In order to ensure that timely action is routinely taken on URCS Committee recommendations, it is recommended that time allowances —— or, as a minimum, time guidelines or objectives —— be established for endorsements at the various reviewing levels. It is hoped that as a result it would be possible to achieve faster approval (or disapproval) than has occurred in the recent case in which a FCI recommended by a joint service task group in March 1972 has not been proposed for adoption until fiscal year 1976.

It is expected that the URCS Committee will obviate the necessity for various ad hoc committees and task groups to be formed to provide special studies and recommendations in ration administration areas. Working with the service headquarters food service offices and OASD level organizations, the URCS Committee should become a very positive force in keeping the URCS modernized, cost effective, and sensitive to the needs of the services and the individual.

## TECHNICAL CHANGES TO THE FCI AND URL

The preceding discussion has provided recommendations on the URL, the FCI, and the URCS Committee. It has been proposed that the URL contain a statutory feeding standard in the form of a ration cost as of a specified date. The URCS Committee would then design the best FCI for that cost, consistent with meeting nutritional standards and providing highest consumer acceptance. This FCI would then be costed at scheduled time intervals to determine the current BDFA monetary value. From time to time the URCS Committee would meet to consider changes to the FCI, and possibly the URL. This subsection is concerned with such changes, the objectives of which would be, for example, to make the FCI a more realistic and effective instrument.

It could be expected that changes to the FCI would involve either changing the types of listed foods, their respective quantities, or both. As mentioned previously, such changes might be made to substitute preferred foods for less preferred ones, to incorporate foods with better nutritional qualities, to reflect changes in food nomenclature, to introduce foods with new processing or packaging procedures, and so forth. Examples of recent changes in the current FCI that may be representative of specific future changes in the index are the transition from good to choice quality beef, the shift to different cuts of beef, the change from low cost USDA butter to higher cost open market priced butter, and the introduction of some frozen items and cake mixes.

The proposed URL is designed to provide improved freedom in making such desirable changes. There is, however, a potential problem in the cost area. It derives from the fact that the BDFA value at any time is actually a "present value" extension of the cost-date standard recorded in the URL. As such, it represents the Congressionally approved level

of feeding. If the URCS Committee feels that a change in FCI is desirable (e.g., the change from USDA surplus to higher cost butter), and if that revision would result in a change in the BDFA, the approval of the Congress would theoretically be required to depart from the legally-based BDFA. Obtaining such approvals would not normally be a matter of sufficient importance to merit Congressional consideration. It is, therefore, recommended that the URL authorize changes in the FCI that can be approved by the Secretary of Defense so long as the cost effect of such changes does not exceed a stated percentage of the BDFA value at that particular time. Based on past experience in the 1967-1974 period, a reasonable cutoff value could be set at about two percent per year, without carryover of any unused part of this percentage from year to year. For example, if the BDFA was $2.50 at the time an annual change in the FCI was proposed, and if the threshold percentage was 2%, the Secretary of Defense would be authorized to approve that change so long as the resultant BDFA was not less than $2.45 nor more than $2.55.

In certain years the URCS Committee may decide to recommend a change in the FCI that exceeds the above mentioned monetary percentage limit. Changes of this magnitude could have a significant impact on the DoD expenditures for food and on the quality of the ration provided the enlisted member. In such instances it is recommended that the Congress be requested to amend the URL so that a new cost-date standard is provided. The guiding principle under this approach is that FCI revisions resulting in small changes in the BDFA would be resolved at the Defense Department level, while larger changes would require action by the Congress. Figure 9 illustrates several situations under these procedures:

| Point | Situation |
|---|---|
| A | The URCS is in effect. The URCS Committee has developed a FCI which provides a BDFA equal to the ration cost stated in the URL as of the effective date indicated in the URL. |
| B | The FCI is costed using DPSC prices at each scheduled interval to yield a new BDFA. |
| C | The Committee recommends several changes to the FCI components and quantities. These changes result in no change in the BDFA. The changes are approved by the Secretary of Defense, and the new FCI is promulgated and placed into effect. |
| D | The Committee recommends changes to the FCI which under current food prices result in a small decrease (e.g., 1%) in the current BDFA. The Secretary of Defense approves the change and the revised FCI is implemented. |

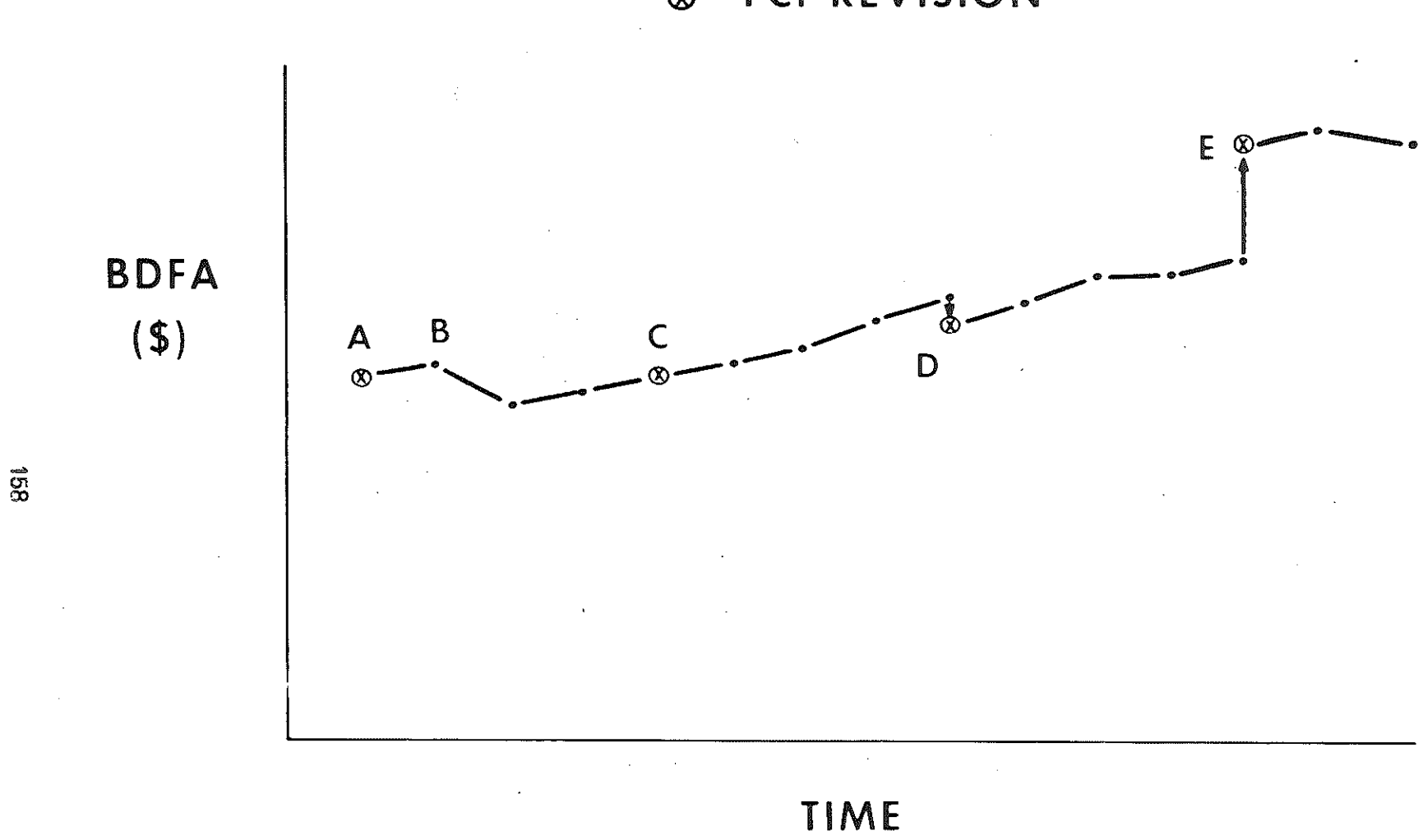


FIGURE 9. EXAMPLES OF BDFA VARIATIONS AND EFFECT OF FCI CHANGES

E A new level of feeding study indicates that the BDFA should be significantly increased (say 5%) to bring it in line with food expenditure patterns in comparable civilian organizations. Such a change in the ration cost is recommended to Congress. Upon approval by Congress, an amended cost-date standard is entered into the URL. The URCS Committee then revises the FCI such that it yields the new ration cost, and this FCI then becomes effective upon issuance by DoD Directive.

Parenthetically it may be noted that the listing of a specific dollar value for the daily subsistence cost in a federal law is not a totally new concept with this study. For example, Title 37, U.S. Code, Section 402 has contained the daily dollar allowance for various categories of enlisted members entitled to the basic allowance for subsistence.

As indicated by the above recommendation to set time limitations on the various approval steps for proposed URCS changes, one area chosen for improvement in the current system is to speed up the process by which revisions occur. One potential delay is in Congressional action on proposed changes. The recommended approach in this area is to apply provisions that are similar to those of the current Pay Comparability System (Title 5, U.S. Code, Sections 5301-5308). One of the key facets of the Pay Comparability System is to make annual adjustments to federal pay rates to keep them comparable with private enterprise pay rates for the same levels of work. Basically this system calls for the President to designate an agent who will compare rates of pay and report recommendations for adjustments. An Advisory Committee on Federal Pay reviews that report and submits its findings and recommendations to the President. He then adjusts the various pay rates and transmits to Congress a report of these adjustments, which are to become effective in the first pay period commencing on or after October 1 of that year. If, because of national emergency or economic conditions, the President considers it inappropriate to make the pay comparability adjustments, he transmits an alternative pay adjustment plan to Congress before 1 September. This alternative plan becomes effective after 1 October unless either House disapproves it before the end of 30 calendar days of continuous session (adjusted for certain adjournments). If either House adopts a resolution disapproving an alternative plan, the President is to take action to adjust the rates of pay to provide comparability, effective as of the first pay period commencing on or after the date on which the resolution is adopted, or on or after 1 October, whichever is later.

It is anticipated that this type of system, with its emphasis on equal treatment and on mandated action, could be applied in the case of modifications to the URL. In this application the "agent" would be the Defense Department, which would submit the recommendations and associated rationale of the URCS Committee, as amended by departmental review. As explained previously, ration cost adjustments would go forward

from DoD only if annual cost adjustments were to exceed a prescribed threshold percentage. Conceptually at least, the Advisory Committee on Federal Pay could perform the review function for the President. The ensuing report from the President to Congress on the URL revision could be acted upon in the same fashion as described above for pay adjustments.

## TOTAL SYSTEM COSTS

Section II of this report has pointed out that the NRL and its related directives are almost exclusively concerned with food. It is of course apparent that food service management is actually directed to food service systems; such systems include not only the food element but also military and and civilian labor, facilities, equipment, supplies and other food service elements. The effective control of food service operations therefore should deal with the costs of the total system. Not only is this a sound management practice which is habitually practiced in commercial food service establishments, but it is also noted that a number of previous studies have recommended a similar approach for military food service. This management approach involves not only concentrating on optimizing system costs, as opposed to suboptimizing food costs, but also on achieving flexibility at the operating level in tradeoffs between food, labor and other costs.

The current DoD budgeting procedures which control funds in "vertical" or functional accounts (e.g., military labor, food, civilian labor, etc.) tend to inhibit cost control on a system basis. Thus, system internal tradeoffs (e.g., the shift of funds from labor to food during a budgetary period) are not allowed unless special authority (e.g., Congressional approval) is obtained. The fact that many of the budgetary accounts, such as food, labor and facilities construction, are controlled by different managers rather than by one food service manager serves to reinforce the inflexibility. As an example, ration costs are determined by a DoD-wide formula (the FCI), and thus food costs are "fenced off" in the sense that the commanding officer can not divert them to any other purpose. Neither can he utilize funds that are budgeted for other purposes to augment the subsistence funds.

In spite of these constraining factors, it is concluded that the URL can and should take the first meaningful step that will legally permit food costs to be viewed in a total system context. In considering how this may be accomplished, it is recognized that there are currently insufficient data and analyses on the various costs of the many different types of military food service systems to provide a sound basis for developing special formulas for use in prescribing total systems costs or for tradeoff purposes. Rather it is recommended as a first step that the URL contain a clause permitting the Secretary of Defense to deviate from the basic ration allowance for particular food service systems in which increased benefits can be realized while concurrently lowering total system costs, or at least not increasing them. This approach was discussed in Section IV under Total

Cost Control System. It would be applied initially on a case-by-case basis with requests for variance from the uniform ration cost (BDFA) originating with the services. Such requests would necessarily include appropriate economic and benefit analyses to support the proposed cost control arrangement. Under such arrangements, controls on other system costs or resources (e.g., number of food service personnel in a system) would be expected to be as stringent as they currently are in the food cost area.

## SECTION VII

## CONCLUSIONS

1. The major objective of this study has been to develop an improved ration cost system. The particular focus of this effort and report has been on determining and outlining the basic form of a new uniform ration cost system (URCS) and the preferred characteristics of the associated Uniform Ration Law (URL) and food cost index (FCI). Although the report seeks to present a well-balanced summary of the major considerations affecting the findings, many supporting technical details have been omitted. For this reason, those readers who are interested in a more complete presentation of the data and the computational methods that have been developed and applied are urged to review the other reports of the URCS study. A list of these reports is provided in the Preface, and the specific references to many of these reports are indicated in the text.

2. General Conclusions. As a result of the overall study effort, conclusions have been reached that an improved ration cost system should have the following characteristics:

- support a level of military feeding that is consistent with the quality of feeding in comparable sectors of the U.S. civilian life,

- ensure a continuation of such a level of feeding under all economic conditions,

- provide a ration for the enlisted member that satisfies prescribed nutritional requirements,

- provide a ration that responds to the consumers' food preferences and thus serves to sustain morale,

- serve as a guideline for food service management at the operating level relative to representative types and quantities of foods and menus for military feeding,

- delegate to the Secretary of Defense and the military services the maximum flexibility within legally defined constraints to determine the actual types and quantities of foods to be purchased and served to meet changing consumer and service requirements,

- provide a form of system that promotes higher attendance and thus fosters the maintaining of an adequate food service capability for mobilization and other emergency situations,

- provide a system that will be adaptable to and compatible with the existing and planned food service and supply systems of all services under all operating conditions,

- provide inherently simple operating and economic controls to facilitate routine use at the unit level and to minimize the required use of resources for administration and financial accounting,

- provide a method permitting cost control at the food service system level, permitting trade-offs of funds between system elements such as food and labor in those particular cases where improvements in total system cost-benefits accrue,

- facilitate system revisions required to accommodate changing food service technology, food preferences, military requirements, nutritional standards, and feeding standards in comparable U.S. civilian organizations, and

- incorporate the concept of a required periodic review of the system by a standing committee in order to achieve desirable modifications on a timely basis.

3. Specific Conclusions. A detailed review of the existing ration cost system, the Navy Ration Law (NRL) and the FCI has lead to the following specific conclusions.

- Although the NRL appears to control daily food issues by virtue of the fact that it lists the ration entitlement in terms of food types and quantities, it actually operates indirectly (through the FCI) as a ration cost control. The concept of a cost control is a sound one, but a more direct approach to such control should be considered.

- There is no method prescribed in the NRL or in current regulations for deriving the FCI from the NRL. As a result, the system is too flexibile from a cost control consideration. For example, the BDFA can conceivably vary over a wide range ($1.20 to $5.37 in a recent analysis) depending upon which FCI components are selected within the generic food nomenclature and quantities now specified in the NRL. With such an allowable range of daily costs per ration, the NRL itself provides no substantial protection of the feeding level standard to either the consumer or the Government. The protection actually has resided in the intelligent interpretation and application of the law by all organizations concerned.

- In another sense, the current system is too inflexible because if the NRL were enforced on a strictly legalistic basis, it would be interpreted to prohibit the issuance and use of a number of foods that are currently purchased and used in rather large quantities by the military (i.e., carbonated beverages, ice cream, etc.). In other cases, it prevents desirable increases or decreases in FCI components. Because of this inflexibility, the current FCI can not accurately reflect DoD food consumption and consumer

preferences. Therefore, monthly BDFA computations are based on an outdated ration entitlement and are not directly relatable to the actual foods and quantities being fed to military consumers.

- In spite of the considerable effort devoted in recent years to placing military pay and allowances on an equitable basis with private enterprise, the current military ration has not been examined in terms of the quality of feeding of comparable groups in U.S. civilian life. As a result, there has been no comparative basis for determining the reasonableness of the quality and monetary value of the ration as established by the NRL and FCI.

- This study did consider this problem, and a comprehensive evaluation of the actual food utilization in the DoD as compared with that experienced in several similar civilian organizations was conducted. The comparison has been with respect to four factors on a per ration basis: food utilization (quantity), expenditures (cost), quality, and nutrition. It is concluded that the DoD ration is generally comparable to the average feeding provided in the civilian organizations in terms of food utilization, quality and nutrition. The most useful basis for comparison is found in the cost area. The investigation has concluded that if the cost of military feeding is viewed in terms of the FCI scheduled to be implemented in fiscal year 1976, the military cost per ration (BDFA) is approximately equal to that of the civilian average (computed on an equivalent cost basis). Thus, the findings lead to the overall conclusion that this FCI, or one that provides an equivalent level of feeding, is reasonable and justifiable for use within DoD. [See NLABS Technical Report 75-43-OR/SA, "The Basic Level of Feeding: A Comparison of Military and Comparable Civilian Food Utilization".]

- Further, it is concluded that the methodology developed and employed in this DoD-civilian comparison analysis should be applied periodically (e.g., about every four years) to reassess the level of feeding of military forces to insure reasonable, continued compatibility with the civilian sector.

- The need for a ration law has been examined, and it has been determined that such a law should be retained. It should apply uniformly and consistently to all services and provide a quantitative standard of feeding for the individual enlisted member.

- The use of a Food Cost Index that will provide a constant level of feeding independent of food price fluctuations and administrative actions should be continued.

- Various types of ration control systems have been examined as candidates for a URCS. These include systems of the following types: monetary control, food control, monetary or food control, monetary and food control, optimization control, and total cost control. The suitability of these systems is a direct function of the operational and policy environment within which they are applied. A full consideration of the parameters

and constraints of existing U.S. military food service and food supply systems has lead to the conclusion that a monetary control system is preferred over systems that exercise food control. In essence, this is the type of control system that is operating in the military today with the BDFA dollar value governing all of DoD food purchasing and serving activities. The evolution of DoD to such an operational system and the successful use of the system over the years confirms that such a system can work and does work well.

- It is concluded that the current relationship between the types of food and quantities specified in the NRL and the FCI should be severed. The URL should establish the ration entitlement in terms of the monetary value of the BDFA as of a specific date; this is termed a "cost-date" standard. The URL would further direct that a FCI be designed with a ration cost equal to the dollar standard contained in the law. The FCI would contain types and quantities of foods which satisfy prescribed nutritional standards and which represent high consumer acceptance. The FCI would then be costed periodically using current DPSC prices to yield the current value of the BDFA. This type of URL with a dated cost standard would protect the consumers from arbitrary changes in the level of feeding. It would also delegate wide flexibility to the Secretary of Defense and the services to design the best food cost index consistent with consumer consumption and preferences, subject to the cost standard limits. DoD could then keep the FCI up-to-date with regard to food consumption and preferences, food technology and military requirements. There should be a direct relationship between the basic allowance for subsistence and the level of feeding established by the BDFA monetary value.

- The NRL expresses the ration entitlement on a daily rather than a meal by meal basis. This entitles the enlisted member to take seconds when he comes to the dining hall as long as he does not exceed his daily entitlement. It is concluded that this method of specifying the entitlement should be continued in the URL. Exhaustive customer surveys conducted in all services and extensive detailed headcount data collected by NDC in the Army, Navy and Air Force have conclusively established that the modern life style of military consumers considerably restricts their desire and opportunities for attendance at dining hall meals. As a result, personnel who get meals as part of their pay do not on the average come close to getting their daily entitlement even when unlimited seconds are offered and the most desirable food service systems (e.g., fast food facilities open continuously) are implemented. Since seconds, therefore, can be directly considered as an opportunity or reasonable attempt to give enlisted personnel a higher portion of their daily entitlement, it is important that the dining hall managers also be allowed to receive appropriate credit for the food provided. The current system does not make this provision since credits are limited to 40% of the BDFA (and only 20% for breakfast), no matter how much food the customer may take. When individuals take food costing more than the monetary credits received by the dining facility, the loss must be made up at the expense of all customers. It is, therefore, concluded that the dining hall should be given appropriate monetary credit when seconds are taken and that this should be done by recording a second headcount signature.

- It has been concluded that the URL should provide an opportunity to focus on the costs of total food service systems rather than solely on food costs. Under this concept, limited tradeoffs of costs between food service system elements (e.g., food and labor) would be permitted and deviations from the BDFA value could result. It is, therefore, concluded that a clause should be included in the URL which will authorize the Secretary of Defense to permit certain specific food service systems to deviate from the basic ration allowance if increased benefits can be realized without increasing total system costs. Requests for such variations from the normal BDFA would originate at the military service level and would be supported by definitive economic and benefit analyses.

- Initially, while the URL implementation actions are being taken, a new FCI should be designed to be consistent with food utilization data in terms of costs/ration for each food group represented and the usage (weight)/ration for each food group, while maintaining the relative proportions of usage between items within each group. A mathematical algorithm and a computer solution for this analytical problem have been provided and are ready for application. However, the study has concluded that the use of a reference menu rather than utilization data is the preferred method for developing the FCI, and a reference menu approach to a new FCI should be implemented as soon as practicable. This approach involves the development of a high preference cyclic menu with an average daily ration cost equal to the desired level of feeding cost. The menu can then be recapitulated into its basic food ingredients and that list of foods used to derive the FCI in the same manner as when food utilization data are applied. The participation of the experienced service dieticians in this FCI design effort is essential.

- Looking beyond the initial URCS development, a longer term system would gain from use of the optimization control method. In this approach a reference cyclic menu would be prepared by either maximizing menu preference or minimizing menu cost subject to meeting specified constraints. In order to achieve true optimization on a practical basis, well designed and tested computer software will be required. The FCI design would be based on a recapitulation of the reference menu as before. This investigation concludes that additional research and development is necessary before this approach can be adopted.

- A standing URCS Committee should be formed to act on the findings of this study, leading to a coordinated DoD position on the structure and operation of a URCS. This committee should have the responsibility for preparation of the new FCI. It should also serve as the action agency for annual reviews of the URCS, for recommending future modifications in the system, and for monitoring future URCS research. A proposed basis for making technical revisions to FCI components has been presented, with the criterion suggested that if the revisions result in small changes in the BDFA value they should be decided upon within the Defense Department. On the other hand, larger changes should require Congressional action, resulting in change in the cost-date standard in the URL.

# SECTION VIII

## RECOMMENDATIONS

1. **Overall.** The URCS Study, as reported by this and several related reports (see Preface), has taken a very broad view of the scope of the assignment and has, therefore, addressed a wide range of related subjects. In addition to the collection of new data and the development of required analytical methods, many findings and recommendations have been reached and presented in various subject areas in the referenced reports. It is to be noted that this section is concerned only with the major recommendations that have resulted from this work. The broad areas addressed by these major recommendations are as follows:

- The basic form of the new ration cost system.

- A definitive basis for establishing a reasonable level of feeding within the armed forces and for keeping that feeding standard current in the face of shifting economic and other influences.

- An approach to a URCS involving a new method for establishing a statutory feeding standard within a Uniform Ration Law, a more flexible basis for formulating a new FCI, and an initial approach for permitting food service management decisions to be based on cost-benefit considerations at the system level.

- Immediate steps that can be taken to provide an incremental improvement in the existing ration cost system under the Navy Ration Law.

- A future concept for ration cost control that is dependent upon continuing research and development to achieve the requisite capability.

- A specific organization within the Defense Department to serve as an action agency for recommending a new URCS and for future review and revision of the system.

Specific recommendations in these areas are summarized below.

2. **Basic Form of the URCS.** Based on the study of the types of ration cost systems, it is recommended that a new monetary control system be implemented in keeping with the design criteria presented herein. Since the current system is based on monetary control, no fundamental change is involved. Further, it is recommended that the dual SIK-BAS structure of the current system be retained. This system provides significant operational flexibility, and it adapts easily to the variety of food service systems and food supply systems that exists within DoD.

3. **Level of Feeding.** It is recommended that the desired level of feeding, or ration entitlement, be clearly stated in the URCS and that it be based on a comprehensive comparison with the level of feeding provided in similar civilian organizations. In terms of specifics, it is recommended that the current level of feeding be that provided by the FCI scheduled to be adopted in fiscal year 1976, or by a FCI that provides an equivalent ration cost. It is also recommended that a similarly conceived and executed level of feeding analysis be conducted about every four years as a means of ensuring the continuing reasonableness of the military ration in relation to civilian food utilization.

4. **The URCS.** The recommended design and functioning of a new URCS is shown diagramatically in Figure 10. This system bears similarity to current ration costing procedures, but it also introduces new features at the food service top management level. A central recommendation is that the NRL be superseded by a URL that contains the following:

— a statement as to eligibility for the ration entitlement.

— a ration entitlement or feeding standard which is expressed in terms of the monetary value of the ration (BDFA) as of a selected date. This cost-date standard should be derived from the level of feeding evaluation.

— instructions that the Secretary of Defense is to issue directives for developing a FCI defined in terms of food components and representing a nutritionally adequate and high consumer preference ration. The FCI is also to be designed so that the BDFA monetary value realized from costing it using military food prices applicable for the specified date is to be equal to the ration cost expressed in the feeding standard. Subsequent to that date the FCI is to be costed periodically using current food prices to determine the present monetary value of the ration.

— instructions that the Secretary of Defense is to make provisions for periodic review of the FCI and other elements of the URCS.

— procedures for authorizing those future recommended modifications to the FCI that result in change in the BDFA value existing at the time.

— a statement permitting the Secretary of Defense to authorize variations from the normal BDFA value for those specific types of food service systems for which it can be shown that additional system benefits can be achieved without increasing total system cost.

As indicated in the figure, the URCS Committee which is recommended herein should be assigned responsibility for developing the FCI. The **Nutritional Standards** of The Surgeons General should be applied in conjunction with the standard ration cost. Initially

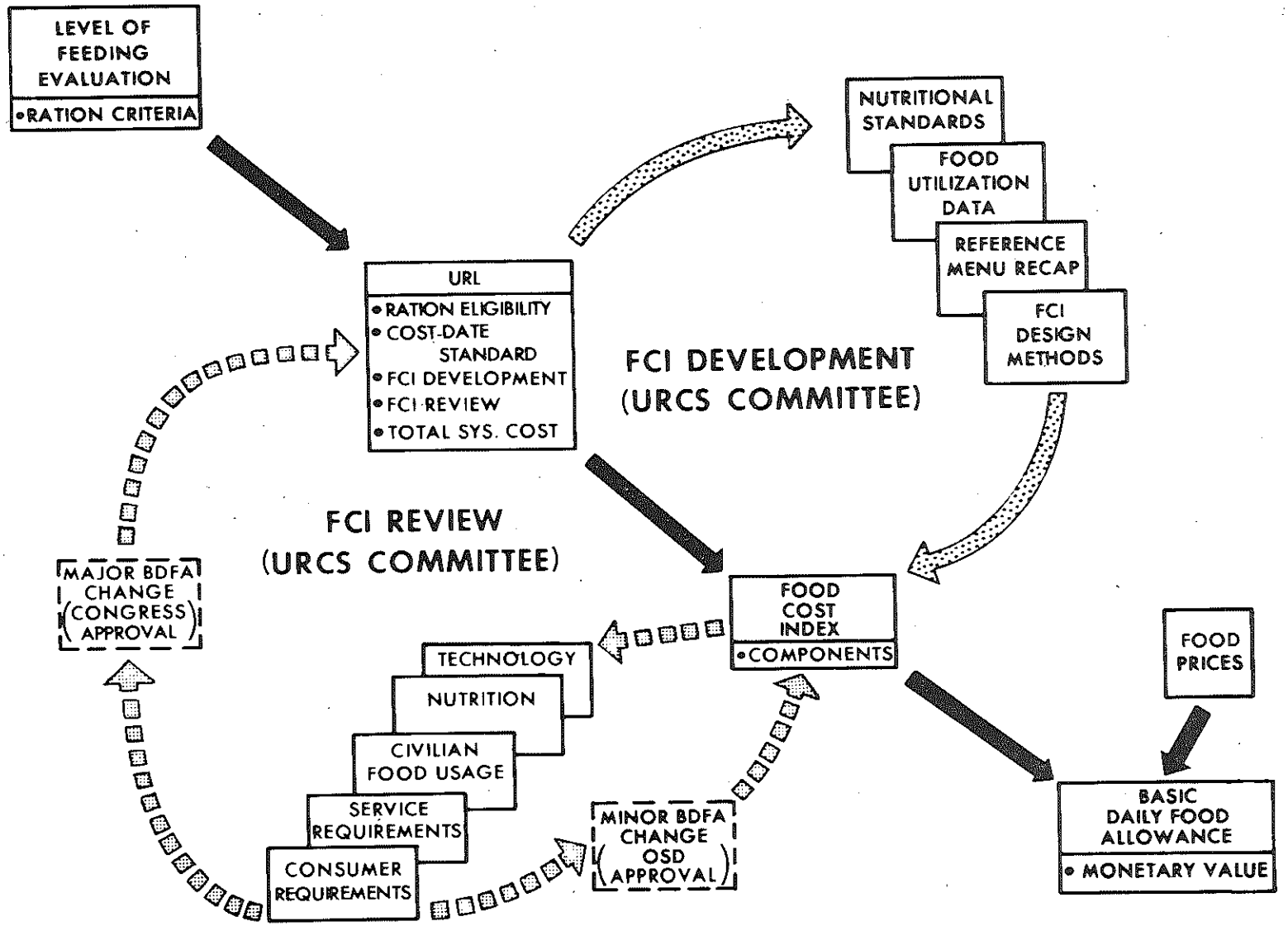


FIGURE 10. MAJOR FEATURES OF THE RECOMMENDED URCS

it is recommended that consumer acceptance be considered in terms of food utilization data. The weighted least squares technique developed for designing the FCI (see Section VI and the referenced TR-75-67-OR/SA) should be applied. For reasons enumerated in this report, it is recommended that the reference menu approach to consumer acceptance be introduced as soon as practicable in the development of the FCI. The recap of such a menu results in a list of food types and quantities that is similar to the food utilization data, and the weighted least squares technique should also be used in the computation. It is recommended that any food items authorized for DoD use be considered eligible for inclusion in the FCI.

It is proposed that the costing of the FCI at scheduled intervals to determine the monetary value of the BDFA should proceed in the same fashion as now. Defense Supply Agency food prices should be used and, depending on the composition of the FCI that is developed, local prices may be applied for any selected components that are purchased on the local market. The BDFA value should be used as a ration cost control measure as it is at the current time.

While it is recommended that the new FCI consist initially of a limited number of components, central costing of the entire reference menu recap list (except locally purchased items) should be introduced as soon as shown to be acceptable for service requirements.

It is recommended that the FCI be reviewed at least annually by the URCS Committee to ensure that it is current in all important respects. If the proposed modifications in the FCI result in a change in the monetary value of the BDFA existing at the time, the following procedure for approval is recommended:

a. if the change in the BDFA value is no greater than a specified percentage of the current BDFA, the FCI modification should be submitted for approval at the Secretary of Defense level.

b. if the change in the BDFA value exceeds the percentage threshold, approval by Congress should be required.

The threshold value recommended for consideration is about two percent per year on a non-cumulative basis —— that is, with no carryover of any unused part of this percentage from year to year. For URCS changes requiring the approval of Congress, it is recommended that procedures similar to those of the Pay Comparability System (Title 5, U.S. Code, Sections 5301-5308) be applied as discussed herein in Section VI.

5. **Near Term Improvements.** As a means of improving the ration cost system in the immediate future, it is recommended that the FCI be revised within the constraints of the NRL. This will address some of the deficiencies noted in the current index. The

principal objective of this effort should be to develop a FCI that is as representative as possible of current food utilization in the military services. The basic utilization data to be used for this purpose have been collected and analyzed in this study program. The recommended procedure for constructing this FCI is the food subgroup methodology that is discussed in Section VI and described more fully in Technical Report 75-67-OR/SA. This approach provides considerable flexibility in realizing a more representative FCI; because this flexibility introduces a number of dietetic decisions (e.g., food groupings) it is important that professional dieticians be involved in the effort. This involvement can be achieved via the participation of the proposed URCS Committee.

6. **Longer Term URCS.** It is recommended that the use of an optimization control method be considered for use in a longer term URCS. As currently conceived, the URL would provide a set of constraints that would serve as controls. An optimized reference menu would be developed consistent with these constraints, and the menu recap would then become the basis for the FCI in the same manner as for the intermediate term URCS. The most likely optimization would involve either 1) maximizing the preference rating of the menu subject to meeting specified cost and nutrition levels, or 2) minimizing the cost of the menu subject to meeting specified preference and nutrition levels. This approach would foster the intuitively appealing concept of basing the BDFA value on the best current solution of food cost-preference-nutrition considerations rather than continued use of a static FCI. Research into the algorithms and computer programs required to make this method feasible is continuing.

7. **URCS Committee.** As a first step in the improvement of the current ration cost system and the development of a new uniform ration cost system, it is recommended that a URCS Committee be formed. This should be a standing committee reporting to the DoD Food Planning Board. It is recommended that the initial composition of the committee include representatives from each of the following:

- U.S. Air Force
- U.S. Army
- U.S. Marine Corps
- U.S. Navy
- The Surgeons General
- Defense Supply Agency
- U.S. Army Natick Development Center

The Natick representative should serve as a non-voting technical advisor in areas such as the URCS study findings and recommendations, methodology for FCI development, and technical data base for food preference and utilization. In addition to the involvement of food service top management, the participation of the senior dietician of each service, or someone with similar experience, on the committee appears to be desirable in view of the anticipated responsibilities. Operating experience by the committee may indicate

that participation by The Surgeons General and the Defense Supply Agency is not required except in the consideration of matters directly impacting the missions of these organizations. The initial major functions recommended for this committee are:

a. Serve as a coordinating body through which the URCS Study is reviewed and acted upon, leading to coordinated recommendations for higher authority. This effort should be specifically oriented to the structure and operation of a uniform ration cost system, including legislation for a Uniform Ration Law and the development of a new FCI. It should also address near term improvements in the ration cost system during the period the URL is in the review and approval stages.

b. Conduct periodic reviews of the URCS, focussing especially on the FCI and providing recommendations for future improvements in the system to keep it closely oriented to the requirements of the services and the enlisted member. Such reviews should occur at least annually.

c. Monitor the on-going Natick Development Center research and development effort in the URCS Program.

The URCS review process should encourage the submission of proposed changes from the services and other interested agencies, followed by analysis and appropriate recommendations by the URCS Committee, and subsequent decision at the Secretary of Defense level, except in those cases requiring action by Congress. The effective use of this committee should ensure a dynamic system that is responsive to needed changes and other actions on a timely basis.

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## APPENDIX A

## HISTORY OF THE NAVY RATION

### 1794

The first law establishing a ration for the men of the Federal Navy is found in the Act of 27 March 1794 (1 Stat., 350). This act authorized the President to procure "X X X by purchase or otherwise X X" six ships to protect the commerce of the United States against depredations by the Algerine Corsairs.

The law established the following ration:

| | | |
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| Sunday | — | 1 lb. bread; 1-1/2 lbs. beef; 1/2 pint rice. |
| Monday | — | 1 lb. bread; 1 lb. pork; 1/2 pint peas or beans; 4 oz. cheese. |
| Tuesday | — | 1 lb. bread; 1-1/2 lbs. beef; 1 lb. potatoes or turnips; pudding. |
| Wednesday | — | 1 lb. bread; 2 oz. butter, or in lieu thereof, 6 oz. molasses; 4 oz. cheese; 1/2 pint rice. |
| Thursday | — | 1 lb. bread; 1 lb. pork; 1/2 pint peas or beans. |
| Friday | — | 1 lb. bread; 1 lb. salt fish; 2 oz. butter or 1 gill of oil; 1 lb. potatoes. |
| Saturday | — | 1 lb. bread; 1 lb. pork; 1/2 pint peas or beans; 4 oz. cheese. |

And there shall also be allowed one-half pint of distilled spirits per day or, in lieu thereof, one quart of beer per day to each ration.

(The value of this ration was 28 cents.)

### 1797

Upon breaking with France in 1797 (1 July 1797, 1 Stat., 524), the Congress authorized the President "X X X should he deem it expedient to cause the frigates UNITED STATES, CONSTITUTION, and CONSTELLATION, be manned and employed X X X", and, in the same Act, established the following ration:

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| Sunday | — | 1 lb. bread; 1-1/2 lbs. beef; 1/2 pint rice. |
| Monday | — | 1 lb. bread; 1 lb. pork, 1/2 pint peas or beans, 4 oz. cheese. |
| Tuesday | — | 1 lb. bread; 1-1/2 lbs. beef; 1 lb. potatoes; or turnips and pudding. |
| Wednesday | — | 1 lb. bread; 2 oz. butter, or in lieu thereof, 6 oz. molasses; 4 oz. cheese; 1/2 pint rice. |
| Thursday | — | 1 lb. bread; 1 lb. pork; 1/2 pint peas or beans. |
| Friday | — | 1 lb. bread; 1 lb. salt fish; 2 oz. butter, or 1 gill oil; 1 lb. potatoes. |
| Saturday | — | 1 lb. bread; 1 lb. pork; 1/2 pint peas or beans; 4 oz. cheese. |

And there shall also be allowed one-half pint of distilled spirits per day or, in lieu thereof, one quart of beer per day, to each ration.

(The value of this ration was 28 cents.)

**1801**

The Congress in 1794 did not intend to establish a permanent Navy; their concern was to put down the Algerine piracies and then to discontinue the Navy. This sentiment underwent some modification, particularly during the break with France in 1797; but the Congress felt that the state of the nation's resources did not warrant a large Navy of the proportions authorized in the Act of 1794. So, in 1801, the Navy was reduced to the "peace establishment"; and, at the same time, a new ration (Act of 3 March 1801, 2 Stat., 110) was established:

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| Sunday | — | 14 oz. bread; 1-1/2 lbs. beef; 1/2 lb. flour; 1/4 lb. suet; 1/2 pint distilled spirits. |
| Monday | — | 14 oz; bread; 1 lb. pork; 1/2 pint peas; 1/2 pint distilled spirits. |
| Tuesday | — | 14 oz. bread; 1 lb. beef; 2 oz. cheese; 1/2 pint distilled spirits. |
| Wednesday | — | 14 oz. bread; 1 lb. pork; 1/2 pint rice; 1/2 pint distilled spirits. |
| Thursday | — | 14 oz. bread; 1-1/4 lb. beef; 1/2 lb. flour; 1/4 lb. suet; 1/2 pint distilled spirits. |

Friday — 14 oz. bread; 4 oz. cheese; 2 oz. butter; 1/2 pint rice; 1/2 pint molasses; 1/2 pint distilled spirits.

Saturday — 14 oz. bread; 1 lb. pork; 1/2 pint peas; 1/2 pint vinegar; 1/2 pint distilled spirits.

By this Act, the allowance of meat and bread was reduced substantially; and Friday became a "banion-day" or a day of short commons.

(The value of this ration was 20 cents.)

**1802**

The reduced ration did not meet with favor among the sailors. In fact, Secretary Smith, in a letter to the Chairman of the Naval Committee in February, 1802, said: "X X X the Navy ration X X X has been found inadequate and has created much murmur and discontent among the seamen; the allowance of meat has been too small, that of vegetables also; by cutting off superfluities, the allowance of these articles may be increased to the proper quantity and the ration be supplied at the present price X X X". Secretary Smith recommended that the following be adopted as the standard ration:

Sunday — 1-1/2 lbs. beef; 1/2 lb. flour or Indian meal; 14 oz. bread; 1/2 pint spirits; 1/2 pint molasses.

Monday — 1 lb. pork; 14 oz. bread; 1/2 pint spirits; 1/2 pint peas.

Tuesday — 1-1/2 lbs. beef; 1 lb. potatoes; 14 oz. bread; 2 oz. butter; 1/2 pint spirits.

Wednesday — 1 lb. pork; 14 oz. bread; 2 oz. cheese; 1/2 pint spirits; 1/2 pint rice.

Thursday — 1-1/2 lbs. beef; 1 lb. potatoes; 1/2 lb. flour or Indian meal; 14 oz. bread; 1/2 pint spirits.

Friday — 1/2 lb. flour or Indian meal; 14 oz. bread; 2 oz. butter; 1/2 pint spirits; 1/2 pint molasses; 1 pint rice.

Saturday — 1 lb. pork; 14 oz. bread; 1/2 pint spirits; 1/2 pint peas; 1/2 pint vinegar.

The Congress failed to act on this recommendation, and in 1808 Secretary Smith again appealed to the Congress on this same matter.

## 1808

In April 1808 Secretary Smith wrote to the Honorable John Montgomery, "Chairman of a Committee", stating in part:

> "The enclosed paper, marked "A", exhibits the component parts of a ration as established XXX (by the Act of 1 July 1797), when the ration was valued at 28 cents and the component parts of a ration as established by the Act of (3rd of March, 1801) providing a naval peace establishment when the ration was valued at 20 cents. From this paper, and from a reference to the prices of the constituent parts of the ration, at the periods referred to and at the present time, the Committee will be able to form a satisfactory opinion as to the propriety of the petition of the officers of the Navy so far as it related to an increase of the price of the ration X X X X. The second object of the petition is that officers when unemployed will be permitted to receive their rations in addition to the half pay which they now receive X X X."

The Congress failed to act on this second attempt of Secretary Smith to reform the ration. Secretary Crowninshield in 1817 appealed to the Congress, and a new ration was carried into the U. S. Navy Regulations of 1818.

## 1818

In April, 1818, President Monroe transmitted to the Congress "X X X a copy of the rules, regulations, and instructions for the naval service, prepared by the Board of Navy Commissioners in obedience to the Act of Congress of February 7, 1815 X X X." Included in these regulations, the new 1817 ration was specified:

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| Sunday | – | 1/4 lb. suet; 1-1/4 lbs. beef; 1/2 lb. flour; 14 oz. bread; 1 oz. sugar; 1/2 pint spirits. |
| Monday | – | 1 lb. pork; 14 oz. bread; 1 oz. sugar; 1/2 pint peas; 1/2 pint spirits. |
| Tuesday | – | 2 oz. cheese; 1 lb. beef; 14 oz. bread; 1 oz. sugar; 1/2 pint spirits. |
| Wednesday | – | 1 lb. pork; 14 oz. bread; 1 oz. sugar; 1/2 pint rice; 1/2 pint spirits. |
| Thursday | – | 1/4 lb. suet; 1-1/4 lbs. beef; 1/2 lb. flour; 14 oz. bread; 1 oz. sugar; 1/2 pint spirits. |

Friday — 4 oz. cheese; 14 oz. bread; 2 oz. butter; 1 oz. sugar; 1/2 pint rice; 1/2 pint molasses; 1/2 pint spirits.

Saturday — 1 lb. pork; 14 oz. bread; 1 oz. sugar; 1/2 pint peas; 1/2 pint vinegar; 1/2 pint spirits.

4 oz. of tea per week.

The Navy Commissioners estimated that the weekly cost of this ration approximated $1.75; however, the official value of the ration was 25 cents.

At this time, a ration beverage other than spirits was introduced.

**1821**

In 1821 the Navy Department asked for a reform of the ration. Secretary Smith-Thompson in January 1821, wrote to the Chairman of the Naval Committee in the House of Representatives, stating in part "X X X Prior to 1801 the price of the ration was 28 cents; in 1801 it was reduced to 20 cents; in 1814 it was raised to 25 cents and has never since been changed X X X." It does not appear, however, that any important change was made in the ration until the great reform of 1842.

**1831-1832**

However, in a General Order in 1831 Secretary Woodbury made this change:

> "X X X All persons entitled to rations who shall voluntarily relinquish the use of that part of them composed of spirits shall be paid six cents per ration, the (then estimated) value of the spirits X X X."

And in January of 1832, Admiral Rodgers, the Chairman of the Navy Commissioners, wrote to Secretary Woodbury, stating in part:

> "X X X Upon the subject of the resolution of the House of Representatives of the 26th instant X X X X the Navy ration may be altered without increase of expense by striking out the suet forming part of the present ration and reducing the quantity of rice and spirits one-half, and the quantity of bread one-seventh, and substituting tea, sugar, and pickles, which will cost about as much as the articles for which they should be substituted X X."

Admiral Rodgers recommended against eliminating or reducing the allowance of cheese because "X X X (cheese) is a favorite article with seamen when sound and good which they have confident expectations it will hereafter be from the process which will be observed in preparing it for preservation X X."

These recommendations were not acted upon until 1842.

## 1842

In 1842 the Board of Navy Commissioners went out of existence, and the scheme of governing the Navy was reorganized into the present bureau system. At this time, the great improvement was made in the ration. The crude idea of a fixed allowance for each day of the week was discarded; and, instead, a more flexible allowance of specified items and permitted substitutes was authorized. The spirit ration was taken away from commissioned officers and midshipmen, and it was prohibited as an issue in kind to warrant officers and men who had not attained their twenty-first birthday. This last class was paid a commutation in lieu of the spirit ration.

The following shows the composition of the ration and the authorized substitutions stipulated by the Act of 28 August 1842 (5 Stat. 546):

> "One pound of salted pork, with half a pint of peas (dried) or beans; or one pound of salted beef, with half a pound of flour, and a quarter of a pound of raisins, dried apples, or other dried fruits; or one pound of salt beef with half a pound of rice, two ounces of butter, and two ounces of cheese; together with fourteen ounces of biscuit; one quarter of an ounce of tea, or ounce of coffee, or one ounce of cocoa; two ounces of sugar, and one gill of spirits; and a weekly allowance of half a pound of pickles or cranberries, half a pint of molasses, and a half a pint of vinegar."
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> "Sec. 2. *And be it further enacted,* That fresh meat may be substituted for salted beef or pork, and vegetables or sauerkraut for the other articles usually issued with the salted meats, allowing one and a quarter pounds of fresh meat for one pound of salted beef or pork, and regulating the quantity of vegetables or sauerkraut so as to equal the value of those articles for which they may be substituted.
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> "Sec. 3. *And be it further enacted,* That, should it be necessary to vary the above described daily allowance, it shall be lawful to substitute one pound of soft bread, or one pound of flour, or half a pound of

rice, for fourteen ounces of biscuit; half a pint of wine for a gill of spirits; half a pound of rice for half a pint of beans or peas; half a pint of beans or peas for half a pound of rice. When it may be deemed expedient by the President of the United States, Secretary of the Navy, commander of a fleet or squadron, or of a single ship when not acting under the authority of another officer on foreign service, the articles of butter, cheese, raisins, dried apples, or other dried fruits, pickles and molasses, may be substituted for each other and for spirits; Provided, The Article substituted shall not exceed in value in articles for which it may be issued, according to the scale which is or may be established for the same."

"Sec. 4. *And be it further enacted,* That in cases of necessity the daily allowance of provisions may be diminished or varied by the discretion of the senior officer present in command but payment shall be thus diminished, according to the scale of prices which is or may be established for the same; but a commander who shall thus make a diminution or variation shall report to his commanding officer or the Navy Department the necessity for the same and give to the purser written orders specifying particularly the diminution or reduction which is to be made."

This ration remained in force until 1861.

**1861-1862**

The Civil War period brought many changes in the laws relating to the Navy, particularly in the affairs which were under the control of the then "Pursers". In a large measure, the reforms of this period are traceable to the genius of Secretary Welles, who had once been Paymaster General of the Navy and who had a keen insight regarding the business side of the Navy. The ration reform of this period is found in Sections 1580-1582 of the Revised Statutes, as follows:

"Sec. 1580. The Navy Ration shall consist of the following daily allowance of provisions to each person. One pound of salt pork, with a half a pint of beans or peas; or one pound of salt beef, with half a pound of flour and two ounces of dried apples, or other dried fruits; or three-quarters of a pound of preserved meat, with half pound of rice, two ounces of butter, and one ounce of desiccated "mixed vegetables"; or three-quarters of a pound of preserved meat, two ounces of butter, and two ounces of desiccated potatoes; together with fourteen ounces of biscuit, one-quarter of an ounce of tea, or one ounce of coffee or cocoa, and two ounces of sugar; and a weekly allowance of half a pint of pickles, half a pint of molasses, and half a pint of vinegar.

"Sec. 1581. The following substitution for the components of the ration may be made when it is deemed necessary by the senior officer present in command: For one pound of salt beef or pork, one pound and a quarter of fresh meat or three-quarters of a pound of preserved meat; for any or all of the articles usually issued with the salted meats, vegetables equal to the same in value; for fourteen ounces of biscuit, one pound of soft bread, or one pound of flour, or half a pound of rice; for half a pint of beans or peas, half a pound of rice, and for half a pound of rice, half a pint of beans or peas. And the Secretary of the Navy may substitute for the ration of coffee and sugar the extract of coffee combined with milk or sugar if he shall believe such substitution to be conducive to the health and comfort of the Navy and not to be more expensive to the Government than the present ration; *Provided*, That the same shall be acceptable to the men."

"Sec. 1582. In case of necessity the daily allowance of provisions may be diminished at the discretion of the senior officer present in command; but payment shall be made to the persons whose allowance is thus diminished, according to the scale of prices for the same established at the time of such diminution. And every commander who makes any diminution or variation shall give to the paymaster written orders therefor, specifying particularly the diminution or variation which is to be made and shall report to this commanding officer or to the Navy Department the necessity for the same."

The 1861 ration remained unchanged in essentials until 1906.

**1906-1907**

The Act of 29 June 1906 (34 Stat., 570) established the following ration allowances:

"The Navy ration shall consist of the following daily allowance of provisions to each person: One pound and a quarter of salt or smoked meat, with three ounces of dried or six ounces of canned or preserved fruit, and three gills of beans or peas, or twelve ounces of flour; or one pound of preserved meat, with three ounces of dried or six ounces of canned or preserved fruit and eight ounces of rice or twelve ounces of canned vegetables, or six ounces of desiccated vegetables; together with one pound of biscuit; two ounces of butter, four ounces of sugar, two ounces of coffee or cocoa, or one-half ounce of tea, and one ounce of condensed milk or evaporated cream; and a weekly allowance of one-quarter pound of macaroni, four ounces of cheese, four ounces of

tomatoes, one-half pint of vinegar or sauce, one-quarter pint of pickles, one-quarter pint of molasses, four ounces of salt, one-half ounce pepper, one-eighth ounce of spices, and one-half ounce of dry mustard. Seven pounds of lard, or a suitable substitute, shall be allowed for every hundred pounds of flour issued as bread, and such quantities of yeast and flavoring extracts as may be necessary.

"The following substitution for the components of the ration may be made when deemed necessary by the senior officer present in command: For one and one-quarter pounds of salt or smoked meat or one pound of preserved meat, one and three-quarter pounds of fresh meat or fresh fish, or eight eggs; in lieu of the articles usually issued with salt, smoked or preserved meat, one and three-quarter pounds of fresh vegetables; for one pound of biscuit and one and one-quarter pounds of soft bread or eighteen ounces of flour; for three gills of beans or peas, twelve ounces of flour or eight ounces of rice or other starch food, or twelve ounces of canned vegetables; for one pound of condensed milk or evaporated cream, one quart of fresh milk, nine ounces of fresh fruit; and for twelve ounces of flour or eight ounces of rice or other starch food, or twelve ounces of canned vegetables, three gills of beans or peas; in lieu of the weekly allowance of one-quarter pound of macaroni, four ounces of cheese, one-half pint of vinegar or sauce, one-quarter pint of pickles, one-quarter pint of molasses and one-eighth ounceof spices, three pounds of sugar, or one and a half pounds of condensed milk, or one pound of coffee, or one and a half pounds of canned fruit, or four pounds of fresh vegetables, or four pounds of flour."

The 1906 law established the "steaming watch" ration to take the place of the old "black pan". While the "black pan" ration was never officially recognized, it, nevertheless, existed because many of the engine room and fire room force were ex-merchantmen and they kept up the good custom of the midnight lunch from the galley residue. The 1906 night ration is as follows:

"An extra allowance of one ounce of coffee or cocoa, two ounces of sugar, four ounces of hard bread or its equivalent, and four ounces of preserved meat or its equivalent shall be allowed to enlist men of the engineer and dynamo force who stand night watches between eight o'clock postmeridian and eight o'clock antemeridian, under steam."

The Act of 2 March 1907 (34 Stat., 1193) made an important change in the 1906 ration:

> "X X X any article comprised in the Navy ration may be issued in excess of the authorized quantity, provided there be an underissue of the same value in some other article or articles X X X."

This provision permitted great flexibility, not only in the use of the ration components, but in the use of delicacies that otherwise would have been denied the men.

There were serious objections to this law, however, such as the fruit component of the ration being dependent upon the use of canned vegetables, dried vegetables, rice or other starch foods, and the allowance of lard upon the use of flour as bread. The calcium content of this ration was entirely too low.

The younger and growing boys of the modern Navy demanded more vegetables, milk, and fruit and less meats. Their demands were met in 1933.

## 1933

The Act of March 2, 1933 (47 Stat., 1423), Appendix "B", provides that the Navy ration shall consist of the following:

### DAILY

8 ounces of biscuit, or 12 ounces soft bread, or 12 ounces flour.
12 ounces preserved meat, or 14 ounces of salt or smoked meat, or 20 ounces fresh meat or fresh fish or poultry.
12 ounces dried vegetables, or 18 ounces canned vegetables, or 44 ounces fresh vegetables.
4 ounces dried fruit, or 10 ounces canned fruit, or 6 ounces preserved fruit, or 16 ounces fresh fruit.
2 ounces cocoa, or 2 ounces coffee, or 1/2 ounce tea.
4 ounces evaporated milk, or 1 ounce powdered milk, or 1/2 pint fresh milk.
1.6 ounces cereals or rice or starch foods.
1/2 ounce cheese.
1.2 eggs.
1.6 ounces lard or lard substitute.
2.5 gill oils or sauces or vinegar.
5 ounces sugar.

## AS REQUIRED

Baking powder and soda, flavoring extracts, mustard, pepper, salt, sirup, spices, and yeast.

> "Any article comprised in the Navy ration may be issued in excess of the authorized quantity: PROVIDED, That there be an underissue of the same value in some other article or articles. (Retained from the Act of 2 March 1907 (34 Stat. 1193).
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> "The Secretary of the Navy is authorized to increase the above-stated allowance on those vessels and stations having an allowed complement of less than one hundred and fifty men and subsisting on a ration allowance, when, in his opinion, such vessels and stations are operating under conditions which warrant such increases.
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> "The Secretary of the Navy is authorized to fix the limit of the cost of rations on destroyers, submarines, mine sweepers, tugs, aircraft, and other vessels and stations subsisted under the direction of commanding officers."

The "steaming watch" ration allowances were eliminated by the Act.

The increased allowances for vessels and stations having a complement of less than one hundred and fifty men and subsisting on a ration allowance, were required because of the reduction in the daily allowances of expensive items — meats — the underissue of which determined the over-issues of fruits and vegetables.

It had long been recognized that small messes administered by the commanding officer should operate on a money allowance, although no authority existed for such action. The Act legalized the procedure that had been followed for years.

## 1942

The act approved February 21, 1942 (Public Law 461 — 77th Congress), "An Act to effect needed changes in the Navy ration" amended the Act of March 2, 1933 (47 Stat. 1423, 34 U.S.C. 902), by adding after the words "sixteen ounces of fresh fruit" the following:

> "on six ounces of canned fruit or vegetable juice, or one ounce of powdered fruit juices, or sixteenths of an ounce of concentrated fruit juices."

This Act was dictated by the trend of time, i.e., the increased demand for fruit and vegetable juices.

1942

The Act approved June 5, 1942, (Public Law 567 – 77th Congress), an Act to authorize aircraft flight rations for officers, enlisted men, and civilian employees of the Navy and Marine Corps while engaged in flight operations:

> "Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter there may be furnished to officers, enlisted men, and civilian employees of the Navy and Marine Corps, while actually engaged in flight operations, an aircraft flight ration in kind, chargeable to the proper Navy or Marine Corps appropriations, which flight rations shall be supplementary to any ration or subsistence allowance now granted to such personnel: Provided, That no part of an aircraft flight ration shall be furnished without cost to any person in a travel status or to any person to whom a per diem allowance is granted in lieu of actual subsistence."

1942

The Act approved October 10, 1942 (Public Law 739 – 77th Congress), an Act to amend the Act approved March 2, 1933, by suspending the provisions relative to a Navy ration in kind, and for other purposes:

> "Be it enacted by the Senate and House of Representatives of the United States of America in Congress Assembled, That the Provisions of the Act approved March 2, 1933 (34 U.S.O. 902a), prescribing a ration in kind shall be suspended except in those cases where the Secretary of the Navy may determine such suspension contrary to the best interests of the Navy: Provided, That during any period of suspension, the Secretary of the Navy is authorized to fix the limit of the cost of the rations furnished persons entitled thereto.
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> "Sec. 2. The authority granted in this Act shall remain in force until six months after the termination of the present war, or until such earlier time as the Congress by concurrent resolution or the President by proclamation may designate."

It was the intent of the foregoing Act to simplify the accounting for provisions used in general messes during the war. ALNAV 228 was, therefore, issued directing that, effective October 1, 1942, all general messes operate on a monetary ration allowance, and to submit reports thereof on S&A Form 45.

It soon became apparent that it was impracticable to assign monetary ration allowances to messes throughout the country, due primarily to variations of prices and foods available in the various areas. Hence, it was decided that shore activities within the continental limits of the United States, where general messes were under the cognizance of an officer of the Supply Corps, should subsist on a ration in kind, and submit the usual report on S&A Form 36. This became effective January 1, 1943.